

# Research News

## Disease and Death in the New World

*Historians now agree that the European discovery of the Americas touched off waves of epidemics, but a debate is raging over the size of pre-Columbian populations*

BY THE TIME Native Americans suffered their bloody encounters with the Spanish conquistadors and, later, European settlers and the U.S. Army, their ranks may already have been decimated, not by the white man's weapons but by his diseases.

In the past 25 years, researchers have realized that Christopher Columbus's discovery of the New World unleashed a wave of pestilence and death that rivals the Black Death in 14th century Europe. With the early explorers came the highly contagious diseases of European cities—smallpox, measles, typhus, scarlet fever, and the like—to which Native Americans had never been exposed. As these crowd diseases swept through, they wiped out perhaps 50 to 90% of the population.

In many Caribbean islands, native populations simply vanished, says Alfred Crosby, a historian at the University of Texas at Austin. Although scholars are still arguing over how many people lived on the islands before Columbus, says Crosby, "there is no argument that they are gone."

But there the agreement ends. While few now dispute that Old World diseases caused a horrendous population crash, debate is still raging on the magnitude, rate, and timing of this hemispheric depopulation.

One camp, led by ethnohistorian and author Henry F. Dobyns, asserts that the Americas had a huge native population—112 million in all—that was virtually wiped out by disease after the Spanish landed in 1492. Dobyns envisions wave after wave of pandemics, starting at the initial point of contact and then sweeping up and down both continents, killing Native Americans before Europeans ever counted them.

For the North American population, over which the debate is most intense, Dobyns puts the estimate at 18 million in 1492. By 1900, that number had dropped to 500,000, maybe less.

Others, like George Milner, an anthropologist at Pennsylvania State University, say that yes, epidemics did occur, but not quite so regularly or with such catastrophic effects. And that means Dobyns's numbers are "enormously high," says Milner. Douglas Ubelaker of the Smithsonian Institution, another member of the "small number"

camp, calculates the pre-Columbus North American total at just 2 million, versus Dobyns's 18 million.

Resolving these differences won't be easy, because the evidence, as Milner describes it, is often "incomplete, spotty, and frequently biased." Crosby likens the data to a Rorschach test: "You interpret it according to your preconceptions."

In some places, documents from the 1500s are abundant and reliable. In others, they are scanty or simply nonexistent. And in the absence of written records, archeologists, ethnohistorians, and anthropologists must use a variety of techniques—and often a host of perilous assumptions—to try to reconstruct what happened when the Old and New Worlds collided in 1492 (see box on p. 1246). Not surprisingly, they are coming to remarkably different conclusions, as was evident at a recent meeting at the Smithsonian on disease and demography in the Americas.

Part of the problem in deciphering just what happened is that, in some places at least, Old World diseases preceded actual contact with explorers by decades or even tens of decades as pathogens were carried

inland along trade routes. The question, then, is whether the population had already been decimated by the time the Europeans made their first estimates.

That is clearly what happened to the Inca, asserts Noble David Cook, a historian at the University of Bridgeport and Yale. When Pizarro's party arrived in Peru in 1532, the Incas told them of a disease that ravaged the population a few years earlier, killing thousands, including the ruler, Huayna Capac, and his principal wife.

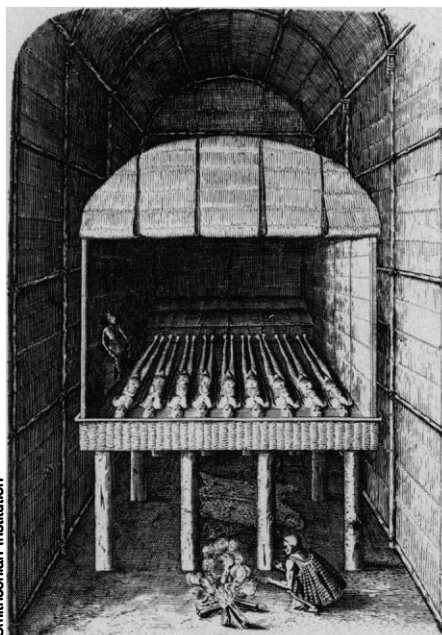
By 1532, 30 to 50% of the population had died and the nation was in the throes of civil war. No wonder, says Cook, that the Spanish conquered with relative ease.

Cook estimates the Inca population just prior to contact at 14 million. By 1600 the number had dropped to 1.5 million to 2 million. Cook's estimate of 14 million clearly puts him in the "big numbers" camp, though his big number is considerably lower than Dobyns's estimate of 38 to 40 million. Others have estimated the population at 3 million or 4 million.

Cook arrives at the 14-million figure by using what are known as projection techniques to estimate the population size before there are reliable numbers. This technique, which Dobyns also uses, basically involves taking two census figures, one as close to the time of contact as possible and one later, calculating the rate of change between them, and then projecting back in time, assuming a constant rate of population decline.

Cook also uses census data, say, from the 1560s, 1570s, and 1580s, to construct what are known as population pyramids. By looking at which age and sex groups are under-represented in a census, he says, you can ascertain that something occurred previously to ravage a particular group. A population pyramid of the Soviet Union today, for example, would show the devastation of the first World War and the Revolution.

The disease that caused the initial damage to the Inca was smallpox, Cook suspects, and the epidemic probably began in the Caribbean in 1519, when Panfla de Naveaux set ashore an infected slave. In fact, it may have been the same epidemic that hit the Aztec a few years earlier, changing the course of Cortes's invasion. "Cortes would



**Burying the dead.** Native populations were decimated but the actual numbers are in dispute.

## Large Numbers, Big Assumptions

At the center of the debate over the severity of epidemics in the Americas post-Columbus is Henry F. Dobyns. A cantankerous ethnohistorian and author, Dobyns published an article in 1966 in *Current Anthropology* that forced his colleagues to rethink their views on early Native American demographics. He is widely credited with having transformed the field—even by those who spend much of their professional career arguing with him.

Whether explicitly or not, much of the research now under way is a response to Dobyns's 1966 assertion—and a similar one by Sherburne F. Cook and Woodrow Borah a few years earlier—that the introduction of contagious disease into the New World brought widespread depopulation and cultural change. If he is right, prior estimates of native population size were off by an order of magnitude.

The first estimate, made in the 1930s, of the North American population before Columbus arrived was 1 million. In 1966, Dobyns upped it to 10 million and soon upped it again to 18 million. His estimate for the entire hemisphere was 90 million to 112 million.

He has been arguing his case ever since. Part of the reason his view is so contentious is that it rests on little hard evidence and a lot of rather speculative assumptions. And part of the reason, Dobyns maintains, is that the debate isn't just about numbers: The size of a population also says something about its complexity.

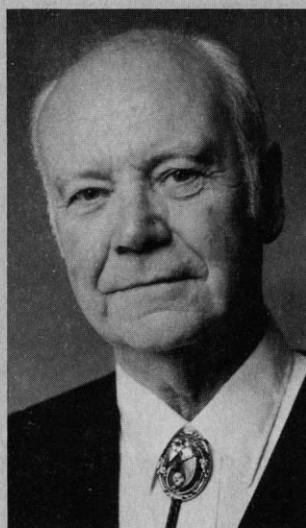
All the sweeping population estimates used by Dobyns and others are based on some form of projection—essentially using the most reliable population numbers available and then projecting back to when there are no, or very few, records.

For his 1966 estimate, Dobyns used what is known as a depopulation ratio, which, he is the first to admit, "is very simplistic." Says Dobyns: "One wouldn't use it unless you were forced to for lack of something better." He found several sample areas—two in Peru and two in Mexico—for which there were fairly firm population estimates at two different times, one close to the Spanish conquest and one later. He then calculated the relative size of the population before the first smallpox epidemic in 1519 and 100 years after it. The ratio turned out to be 20:1, and Dobyns applied that factor to the rest of the hemisphere. That's all well and good for the Andes and Central Mexico, where there are relatively reliable census figures. Where things get messy is in North America because records are scanty. There, Dobyns simply used the lowest population estimate he could find—from 1890—and multiplied by 20 to estimate the pre-1492 population.

Since then, both Dobyns and Noble David Cook, a University of Bridgeport historian who uses similar techniques to study the Inca, have refined the projections by explicitly taking into account each known epidemic. "Henry and I make very similar assumptions," says Cook. "I am simply a lot more conservative in my estimates than he is." For the Andes, Cook puts the pre-1492 population at 14 million. Dobyns estimates 38 million or 40 million.

In the best of cases, Dobyns says, you can reconstruct the epidemic sequence—in other words, what hit, when and where—but it is not an easy task. First, you must verify that an epidemic occurred and then diagnose the disease, some 400 years after the fact. The idea is to then apply what is known about mortality rates from that same disease in later epidemics. Even Dobyns admits some tricky assumptions are involved: for example, that measles in Iceland in 1707 behaved the same way as measles in South America in the 16th century. "Physical anthropologists argue that viruses recognize racial differences. Frankly, I don't think viruses give a damn about race."

When Dobyns began championing his cause, some of his colleagues dug in their heels and resisted any major revision in numbers. Some still do, says Cook, but he notes that nonetheless the numbers have been creeping slowly upward. ■ L.R.



**Rewriting history.** Henry Dobyns transformed the field.

have been thrown out of Mexico if it hadn't been for smallpox," says Crosby. The epidemic raged for 75 days in Tenochtitlan, or Mexico City, then Cortes invaded.

Although it is hard to pin down the origin of the epidemic and its overland route, there is no question that it hit—and hit hard—in 1526, says Cook. The tale is recounted over and over again in records of Spanish soldiers who arrived in Peru just 6 years later and described the conquest.

Evidence also comes from the Inca "keepers of the record," who recorded history on quipos, or knotted strings. In 1543, one of the Spanish governors, Vaca de Castro, called them together to tell him about the past. The quipos are gone, but the written accounts of what the Incas said remain, says Cook. They, too, described the death of Capac and ensuing chaos.

From 1532 on, says Cook, "we are on more solid documentary ground." First-hand reports, both abundant and corroboratory, describe epidemics coming fast on the heels of each other: measles in 1531, and what looks like plague or typhus in 1546–48. Then another round of what seemed to be measles in 1556–58. Then relative calm until 1585–91, when several epidemics hit simultaneously: smallpox, measles, and probably typhus again, with catastrophic consequences. Near Quito, 30,000 out of 80,000 died.

In a different part of South America, along the Amazon River, Betty Meggers, an archeologist at the Smithsonian Institution, is finding that the archeological data and the documentary record don't always coincide. And she is putting her money on the ruins, not on what she considers to be unreliable eyewitness accounts.

From such eyewitness accounts, like that of Friar Gaspar de Carvajal, who accompanied Spanish explorer Francisco de Orellana on his 1541 journey down the Amazon River, numerous scholars have concluded that a huge population—up to 10 million—lived in the Amazon Basin. Carvajal described vast, densely populated cities along the river bank and 10,000 warriors chasing them in canoes.

But Meggers isn't buying the conventional wisdom. For the past 12 years she has been examining prehistoric sites along the tributaries of the Amazon. Using a technique called ceramic seriation to analyze pottery, she has been able to determine how much of a site was occupied at one time and how many sites were occupied simultaneously. And, contrary to the predominant view, she concludes that the Amazon Indians were not a large, sedentary population. Rather, Meggers finds evidence that villages were occupied by small populations who

moved every 10 years or so when the soil wore out, returning to the same site roughly every 50 years.

Meggers has augmented her archeology with an analysis of the carrying capacity of the Amazon Basin, which she says can support just 0.3 persons per square kilometer. And that, along with the archeologic data, leads her to conclude that the entire Amazon Basin, which she calls a "counterfeit paradise with severe limitations for human exploitation," could have supported no more than 1.5 million to 2 million before Columbus.

Meggers's lowball estimates are admittedly not popular. She has certainly not convinced Cook, who tends to believe the early Spanish accounts of large villages along the river. "I suspect what was there was wiped out. I find it difficult to understand how the archeological evidence can be well maintained in the Amazon Basin at all, given the nature of the terrain and the climate."

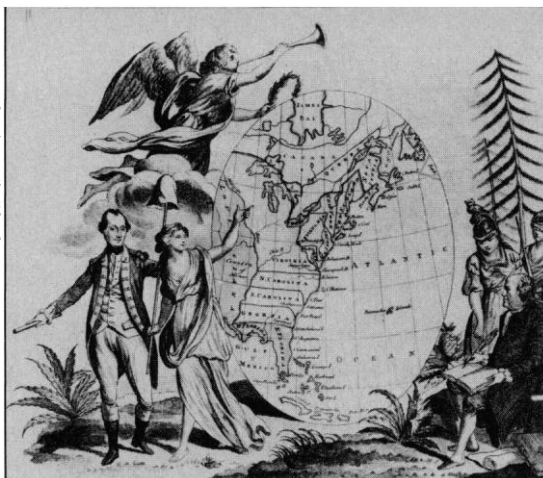
"I have great respect for Betty Meggers as an archeologist," adds Cook, "but I do have a problem with people making sweeping generalizations of the whole Amazon Basin based on one slice."

Such disputes notwithstanding, estimates for South America seem rock solid when compared with many of those for North America. The problem is simply that Europeans landed on the perimeter of the continent in the 1500s but did not reach much of the interior until the 1700s. What happened in this fuzzy period before written records, known as protohistory, is anyone's guess.

Whole cultures may have been wiped out long before extensive contact occurred. For example, in 1539 the Spanish explorer Hernando de Soto described a complex Native American society in the southeastern part of North America. But when the European settlers arrived in the 1700s, the sophisticated group de Soto saw—now known to be part of the Mississippian culture—was gone.

Dobyns, the leading proponent of the theory that pandemics ravaged the Native American population in the 1500s before anyone counted, bases much of his claims on epidemiologic reasoning. He assumes that an infectious disease like smallpox would run flat out as long as there was a susceptible population. Thus, if every historic account in, say, 1535 mentions a serious disease, Dobyns assumes it was a pandemic, asserting that there was ample opportunity for pathogens to hitch a ride over from Cuba to the tip of Florida, for instance. He argues that this is exactly what happened in 1514. Dobyns also maintains that if an epidemic spread south from Mexico City to Peru, for example, it would also have spread an equal

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**North America, 1783.** By the time the settlers arrived, some cultures may have vanished.

distance north on native trails.

Dobyns has a supporter in Cook, who makes similar assumptions in his analysis of the Andes. "I believe that the first introduction of a disease led to a pandemic that hit everyone, even hunter gatherers and fishermen. Dobyns and I agree on that one. I will even stick my neck out and say that pandemics swept through North America before anyone came." But he stops short of endorsing Dobyns's high numbers.

Others, like Milner, the Smithsonian's Ubelaker, and Dean Snow, an anthropologist at the State University of New York at Albany, argue that the picture is not so simple. For one, they say, disease transmission would have been blocked by either social or geographic barriers. "It is unlikely that pandemics swept uniformly and swiftly through North America," contends Milner.

In addition, Milner and Ubelaker point to emerging evidence that some native populations were already in decline by the time the first European explorers arrived. The shift from hunting to agriculture and to increasing local population density often brought nutritional deficiencies and an increased disease load—though a different set of diseases from those brought over by the Europeans. Thus, they say, it is likely that Old World pathogens had a varying effect, depending on the health of the native population.

"Henry [Dobyns] is just plain wrong, by orders of magnitude," says Snow, who bases his conclusions on his intensive study of excavations of Mohawk villages in upstate New York. In fact, when Snow set out to study the Mohawk, he was looking specifically for evidence of the epidemics in the 1500s that Dobyns had postulated—for large villages and then a population crash. Instead, he found the opposite: population growth throughout the 1500s. "I assert that there were no epidemics of any significance in the Northeast prior to the 1600s."

Snow believes instead that the first epidemic to hit the Mohawk was the well-recorded 1633 smallpox epidemic. And it

behaved like a first-time, virgin-soil epidemic, he notes, knocking out 75% of the population in one decade alone.

Snow has been lucky, in that the Mohawk have proved relatively easy to study. They built their towns in the fertile land west of Albany where farmers keep plowing into them. Thus, almost all the major sites are thought to have been discovered. And the sites are easy to read, as the Mohawk lived in small, tightly packed towns, in which surface area is a good indication of population density. The reports of Dutch settlers, who arrived in the Mohawk Valley in the 1630s and counted

the long houses, provide confirmation.

From those accounts and archeological reconstruction, Snow estimates that 8100 Mohawk lived in the valley in 1633 just before the smallpox epidemic. If Dobyns were right, says Snow, there would necessarily be more than 8100 Mohawk in 1500, "but if I work backward, there isn't room to house even 8100 in 1500, much less a larger population. I can't account for epidemics; I can't even account for normal population growth." The only way to explain the increase he sees is by in-migration of other Indian nations. "That is not consistent with Dobyns but that is the way it goes."

Dobyns's estimate for the total population of North America has also come under fire from Ubelaker of the Smithsonian, who has taken perhaps the latest tally for the continent. He puts the figure at nearly 2 million—far lower than Dobyns and lower even than Ubelaker expected. "I was surprised, quite frankly."

Rather than using the admittedly crude projection techniques of Dobyns and Cook, Ubelaker has collected data on each of hundreds of tribes in North America, drawing on both the documentary record and on available data from archeology and physical anthropology. For each tribe, he says, there are usually a couple of early accounts that mention its size. He then turns to other scholars for their assessment of the reliability of these early eyewitnesses. Says Ubelaker: "It comes down to the scholarly faith you put in that work."

Ubelaker admits, however, that his conclusions are open to question because they rely on documentary evidence. "It could be argued that all those people are wrong—that there is a gross tendency for everyone to rely too heavily on estimates made too low and too late, and that, as Dobyns says, the population has already been decimated by the time the explorers got there and described it. Dobyns could very well be right. But if so, it is certainly not apparent in the archeological record." ■ **LESLIE ROBERTS**