

Anthro Notes

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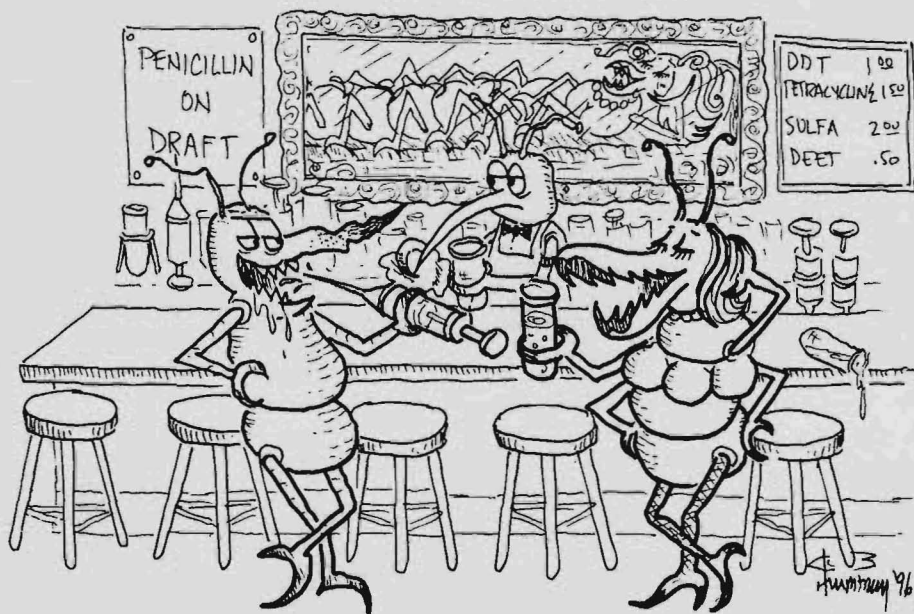
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DISEASE IN HUMAN EVOLUTION: THE RE-EMERGENCE OF INFECTIOUS DISEASE IN THE THIRD EPIDEMIOLOGICAL TRANSITION

by George J. Armelagos, Kathleen C. Barnes, and James Lin

For millions of years, humans and their ancestors suffered from diseases -- both the kind caused by infectious pathogens (e.g., bacteria, viruses, parasites) and the kind caused by our own bodies as they age and degenerate. Over this long period, humans constantly created new ways of living and eating, and actual physical or genetic changes evolved to minimize the effects of these diseases. From the point of view of a bacteria or virus, however, any shift in the physical makeup or behavior of its human host represents not only an obstacle but also a challenge to be overcome. As a result, new diseases emerged with each major change in the human way of life.

For nearly four million years, humans lived in widely dispersed, nomadic, small populations that minimized the effect of infectious diseases. With the agricultural revolution about 10,000 years ago, increasing sedentism and larger population groupings resulted in the **first epidemiological transition** in which infectious and nutritional diseases increased. Within the last century, with the advent of public health measures, improved nutrition and medicine, some populations in developed nations underwent a **second epidemiological transition**. During this transition, infectious diseases declined and non-infectious, chronic



diseases, and degenerative conditions increased. Today, with the increasing use of antibiotics, we are facing a **third epidemiological transition**, a reemergence of infectious disease, with pathogens that are antibiotic-resistant and have the potential to be transmitted on a global scale. Populations that experienced and those that never experienced the second epidemiological transition are both increasingly exposed to antibiotic-resistant pathogens.

"Emerging" pathogens are seen as "new" diseases, "discovered" when they have an impact on our adaptation or survival. Even when we take a more holistic ecological perspective, it is often limited to a position that considers "emerging" disease as the result of environmental changes that are only relevant to the present situation as it affects humans here and now. This article argues that the emergence of "new" diseases has been the human pattern since the origin of the hominids and accelerated with the shift to agriculture 10,000 years ago.

Paleolithic Baseline

For most of their 4,000,000 years of evolutionary history, human populations lived in small, sparsely settled groups. Population size and density remained low throughout the Paleolithic. Fertility and mortality rates in small gathering-hunting populations would have to have been balanced for the population size to remain small.

Demographic factors creating this stability are still a matter of discussion. Some demographers argue that gatherer-hunters were at their maximum natural fertility, balanced by high mortality. Armelagos, Goodman and Jacobs (1991) argue, however, that gatherer-hunters maintained a stable population with controlled moderate fertility balanced by moderate mortality.

The demographic changes following the Neolithic may provide insights into the case for population stability controlled by moderate fertility and mortality during the Paleolithic. Following the

Neolithic revolution, a dramatic increase in population size and density occurred. It was thought that the Neolithic economy generated food surpluses that led to a better nourished and healthier population with a reduced rate of mortality. Since populations were at their natural maximum fertility, there would have been a rapid increase in population size.

The empirical evidence suggests an alternative scenario in the shift from gathering and hunting to agriculture. The picture suggests a much bleaker picture of health. Instead of experiencing improved health, there is evidence of a substantial increase in infectious and nutritional disease (Cohen and Armelagos 1984). A paradox emerges if the traditionally accepted models of Paleolithic fertility and mortality are correct. How can a population experiencing maximum fertility during the Paleolithic respond with exponential growth in population when their health is deteriorating?

A consideration of the disease ecology of contemporary gatherer-hunters provides insights into the types of disease that probably affected our gatherer-hunter ancestors. Polgar (1964) suggests that gatherer-hunters had two types of disease to contend with in their adaptation to their environment. One class of disease would be those organisms that had adapted to prehuman ancestors and persisted with them as they evolved into hominids. Head and body lice (*Pediculus humanus*), pinworms, yaws, and possibly malaria would be included in this group. Cockburn (1967) adds to this list most of the internal protozoa found in modern humans and such bacteria as salmonella, typhi, and staphylococci.

The second class of diseases are the zoonotic, which have non-human animals as their primary host and only incidentally infect humans. Humans can be infected by zoonoses through insect bites, by preparation and consumption of contaminated flesh, and from wounds inflicted by animals. Sleeping sickness, tetanus, scrub typhus, relapsing fever, trichinosis, tularemia, avian or ichthyic tuberculosis, leptospirosis, and schistosomiasis are among the

zoonotic diseases that could have afflicted earlier gatherer-hunters (Cockburn 1971).

Although early human populations were too small to support endemic (constantly present) pathogens, they maintained some kind of relationships with the vectors that would later serve to perpetuate such human host-specific diseases as yellow fever and louse-borne relapsing fever. Certain lice were ectoparasites as early as the Oligocene, and the prehumans of the early Pliocene probably suffered from malaria, since the *Anopheles* (mosquito) necessary for transmission of the disease evolved by the Miocene era. Frank Livingstone, an anthropological epidemiologist, dismisses, however, the potential of malaria in early hominids except in isolated incidences because of the small population size and an adaptation to the savanna, an environment that would not have included the mosquitoes that carry the malaria plasmodium.

The range of the earliest hominids was probably restricted to the tropical savanna. This would have limited the pathogens that were potential disease agents. During the course of human evolution, the habitat expanded gradually into the temperate and eventually the tundra zones. Hominids, according to epidemiologist Frank Lambrecht, would have avoided large areas of the African landscape because of tsetse flies and thus avoided the trypanosomes they carried. He also argues that the evolution of the human species and its expansion into new ecological niches would have led to a change in the pattern of trypanosome infection. While this list of diseases that may have plagued our gathering-hunting ancestors is informative, those diseases that would have been absent are also of interest. The contagious community diseases such as influenza, measles, mumps, and smallpox would have been missing. There probably would have been few viruses infecting these early hominids, although Cockburn (1967) disagrees and suggests that the viral diseases found in non-human primates would have been easily transmitted to hominids.

The First Epidemiological Transition

Disease in Agricultural Populations

The reliance on primary food production (agriculture) increased the incidence and the impact of disease. Sedentism, an important feature of agricultural adaptation, conceivably increased parasitic disease spread by contact with human waste. In gathering-hunting groups, the frequent movement of the base camp and frequent forays away from the base camp by men and women would decrease their contact with human wastes. In sedentary populations, the proximity of habitation area and waste deposit sites to the water supply is a source of contamination. While sedentarism did occur prior to the Neolithic period in those areas with abundant resources, once there was the shift to agriculture, sedentary living was necessary.

The domestication of animals provided a steady supply of vectors and greater exposure to zoonotic diseases. The zoonotic infections most likely increased because of domesticated animals, such as goats, sheep, cattle, pigs, and fowl, as well as the unwanted domestic animals such as rodents and sparrows, which developed (Polgar 1964) permanent habitats in and around human dwellings. Products of domesticated animals such as milk, hair, and skin, as well as the dust raised by the animals, could transmit anthrax, Q fever, brucellosis, and tuberculosis. Breaking the sod during cultivation exposed workers to insect bites and diseases such as scrub typhus. Frank Livingstone showed that slash-and-burn agriculture in west Africa exposed populations to *Anopheles gambiae*, a mosquito which is the vector for *Plasmodium falciparum*, which causes malaria. Agricultural practices also create pools of water, expanding the potential breeding sites for mosquitos. The combination of disruptive environmental farming practices and the presence of domestic animals also increased human contact with arthropod (insect) vectors carrying yellow fever, trypanosomiasis, and filariasis, which then developed a preference for human blood. Some disease vectors developed dependent relationships with human habitats, the best example of which is *Aedes aegypti* (vector for yellow fever

and dengue), which breeds in stagnant pools of water in open containers. Various agricultural practices increased contact with non-vector parasites. Irrigation brought contact with schistosomal cercariae, and the use of feces as fertilizer caused infection from intestinal flukes (Cockburn 1971).

The shift to agriculture led to a change in ecology; this resulted in diseases not frequently encountered by forager populations. The shift from a varied, well-balanced diet to one which contained fewer types of food sometimes resulted in dietary deficiencies. Food was stored in large quantities and widely distributed, probably resulting in outbreaks of food poisoning. Intensive agricultural practices among the prehistoric Nubians resulted in iron deficiency anemia as did the reliance on cereal grain, weaning practices, and parasitic infestation. The combination of a complex society, increasing divisions of class, epidemic disease, and dietary insufficiencies no doubt added mental stress to the list of illnesses.

Disease in Urban Populations

The development of urban centers is a recent development in human history. In the Near East, cities as large as 50,000 people were established by 3000 BC. In the New World, large urban settlements were in existence by AD 600. Settlements of this size increase the already difficult problem of removing human wastes and delivering uncontaminated water to the people. Cholera, which is transmitted by contaminated water, was a potential problem. Diseases such as typhus (carried by lice) and the plague bacillus (transmitted by fleas or by the respiratory route) could be spread from person to person. Viral diseases such as measles, mumps, chicken pox, and smallpox could be spread in a similar fashion. Due to urbanization, populations for the first time were large enough to maintain disease in an endemic form. Aidan Cockburn, a paleopathologist, estimated that populations of one million would be necessary to maintain measles as an endemic disease. What was an endemic disease in one population could be the source of a serious epidemic (affecting a large

number of people at the same time) disease in another group. Cross-continental trade and travel resulted in intense epidemics (McNeill 1976). The Black Death, resulting from a new pathogen, took its toll in Europe in the 1300s; this epidemic eliminated at least a quarter of the European population (approximately 25 million people).

The period of urban development can also be characterized by the exploration and expansion of populations into new areas that resulted in the introduction of novel diseases to groups that had little resistance to them (McNeill 1976). For example, the exploration of the New World may have been the source of the treponemal infection (syphilis) that was transmitted to the Old World. This New World infection was endemic and not sexually transmitted. When it was introduced into the Old World, a different mode of disease transmission occurred. The sexual transmission of the treponeme created a different environment for the pathogen, and it resulted in a more severe and acute infection. Furthermore, crowding in the urban centers, changes in sexual practices, such as prostitution, and an increase in sexual promiscuity may have been factors in the venereal transmission of the pathogen.

The process of industrialization, which began a little over 200 years ago, led to an even greater environmental and social transformation. City dwellers were forced to contend with industrial wastes and polluted water and air. Slums that arose in industrial cities became focal points for poverty and the spread of disease. Epidemics of smallpox, typhus, typhoid, diphtheria, measles, and yellow fever in urban settings were well documented. Tuberculosis and respiratory diseases such as pneumonia and bronchitis were even more serious problems, with harsh working situations and crowded living conditions. Urban population centers, with their extremely high mortality, were not able to maintain their population bases by the reproductive capacity of those living in the city. Mortality outstripped fertility, requiring immigration to maintain the size of the population.

The Second Epidemiological Transition: The Rise of Chronic and Degenerative Disease

The second epidemiological transition refers to the shift from acute infectious diseases to chronic non-infectious, degenerative diseases. The increasing prevalence of these chronic diseases is related to an increase in longevity. Cultural advances results in a larger percentage of individuals reaching the oldest age segment of the population. In addition, the technological advances that characterize the second epidemiological transition resulted in an increase in environmental degradation. An interesting characteristic of many of the chronic diseases is their particular prevalence and 'epidemic'-like occurrence in transitional societies, or in those populations undergoing the shift from developing to developed modes of production. In developing countries, many of the chronic diseases associated with the epidemiological transition appear first in members of the upper socioeconomic strata, because of their access to Western products and practices.

With increasing developments in technology, medicine, and science, the germ theory of disease causation developed. While there is some controversy about the role that medicine has played in the decline of some of the infectious diseases, a better understanding of the source of infectious disease exists, and this admittedly has resulted in

increasing control over many infectious diseases. The development of immunization resulted in the control of many infections and recently was the primary factor in the eradication of smallpox. In the developed nations, a number of other communicable diseases have diminished in importance. The decrease in infectious disease and the subsequent reduction in infant mortality has resulted in greater life expectancy at birth. In addition, there has been an increase in longevity for adults and this has resulted in an increase in chronic and degenerative diseases.

Many of the diseases of the second epidemiological transition share common etiological factors related to human adaptation, including diet, activity level, mental stress, behavioral practices, and environmental pollution. For example, the industrialization and commercialization of food often results in malnutrition, especially for those societies in "transition" from subsistence forms of food provision to agribusiness. The economic capacity to purchase food that meets nutritional requirements is often not possible. Obesity and high intakes of refined carbohydrates are related to the increasing incidence of heart disease and diabetes. Obesity is considered to be a common form of malnutrition in developed countries and is a direct result of an increasingly sedentary lifestyle in conjunction with steady or increasing caloric intakes.



EMERGING PATHOGENS

A unique characteristic of the chronic diseases is their relatively recent appearance in human history as a major cause of morbidity. This is indicative of a strong environmental factor in disease etiology. While biological factors such as genetics are no doubt important in determining who is most likely to succumb to which disease, genetics alone cannot explain the rapid increase in chronic disease. While some of our current chronic diseases such as osteoarthritis were prevalent in early human populations, other more serious degenerative conditions such as cardiovascular disease and carcinoma were much rarer.

The Third Epidemiological Transition

Today, human populations are moving into the third epidemiological transition. There is a reemergence of infectious diseases with multiple antibiotic resistance. Furthermore, this emergence of diseases has a potential for global impact. In a sense, the contemporary transition does not eliminate the possible co-existence of infectious diseases typical of the first epidemiological transition (some 10,000 years ago) in our own time; the World Health Organization (WHO) reports that of the 50,000,000 deaths each year, 17,500,000 are the result of infectious and parasitic disease. WHO reports that 1.7 million have tuberculosis and 30 million people are infected with HIV.

The emergence of infectious disease has been one of the most interesting evolutionary stories of the last decade, and has captured the interest of scientists and the public. The popular media, with the publication of books such as *The Hot Zone* and movies such as *Outbreak*, has captured the public's fascination with emerging diseases as threats to human survival. There is genuine scientific concern about the problem. David Satcher (Director of the Centers for Disease Control in Atlanta, GA) lists 22 diseases that have emerged in the last 22 years, including Rotovirus, Ebola virus, *Legionella pneumophila* (Legionnaire's Disease), Hantaan Virus (Korean hemorrhagic fever), HTLV I, *Staphylococcus* toxin, *Escherichia coli* 0157:h7,

HTLV II, HIV, Human Herpes Virus 6, Hepatitis C, and Hantavirus isolates.

The emergence of disease is the result of an interaction of social, demographic, and environmental changes in a global ecology and in the adaptation and genetics of the microbe, influenced by international commerce and travel, technological change, breakdown of public health measures, and microbial adaptation. Ecological changes such as agricultural development projects, dams, deforestation, floods, droughts and climatic changes have resulted in the emergence of diseases such as Argentine hemorrhagic fever, Korean hemorrhagic fever (Hantaan) and Hantavirus pulmonary syndrome. Human demographic behavior has been a factor in the spread of dengue fever, and the source for the introduction and spread of HIV and other sexually transmitted diseases.

The engine that is driving the reemergence of many of the diseases is ecological change that brings humans into contact with pathogens. Except for the Brazilian purpuric fever, which may represent a new strain of *Haemophilus influenzae*, biotype *aegyptius*, most of the emerging diseases are of cultural origin. The development of antibiotic resistance in any pathogen is the result of medical and agricultural practices. The indiscriminate and inappropriate use of antibiotics in medicine has resulted in hospitals that are the source of multi-drug resistant strains of bacteria that infect a large number of patients. Agricultural use in which animal feed is supplemented with sub-therapeutic doses of antibiotics has risen dramatically in the last half century. In 1954, 500,000 pounds of antibiotics were produced in the United States; today, 40,000,000 pounds are produced annually.

Conclusion

Recently, much attention has focused on the detrimental effects of industrialization on the international environment, including water, land, and atmosphere. Massive industrial production of commodities has caused pollution. Increasingly there is concern over the health implications of

contaminated water supplies, over-use of pesticides in commercialized agriculture, atmospheric chemicals, and the future effects of a depleted ozone layer on human health and food production. At no other time in human history have the changes in the environment been more rapid or so extreme. Increasing incidence of cancer among young people and the increase in respiratory disease has been implicated in these environmental changes.

Anthropogenic impact from technology has been the pattern since Neolithic times. Within the last 300 years, transportation has played a major role in disease patterns by bringing larger segments of humans into contact with the pathogens at an accelerated rate. The emergence of disease in the New World upon contact with Europeans was a consequence of large sailing ships that became a major mode of transportation. Now it is possible for a pathogen to move between continents within a matter of hours. We live in a time where there exists a virtual viral superhighway, bringing people into contact with pathogens that affect our adaptation. The present pattern reflects an evolutionary trend that can be traced to the beginning of primary food production. The scale has changed. The rates of emerging disease and their impact can now affect large segments of the world population at an ever increasing rate, and we need to be increasingly aware of the implications for today's human populations around the globe.

For further reading

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George Armelagos is professor of anthropology at Emory University in Atlanta, Georgia. He received his Ph.D. from the University of Colorado in 1968, and his research has focused on diet and disease in human adaptation. A former President of the American Association of Physical Anthropologists, he has authored or co-authored more than 120 books and articles, including Disease in Populations in Transition: Anthropological and Epidemiological Perspective (with Alan Swedlund) and Consuming Passions: The Anthropology of Eating (with Peter Farb).

Kathleen C. Barnes is an instructor at The Johns Hopkins Center for Asthma and Allergy in Baltimore, Maryland. She received her Ph.D. in Anthropology from the University of Florida, Gainesville in 1992 after working as a registered nurse for several years. Her interests include health and disease in the Caribbean.

James Lin is an anthropology and human biology major at Emory University who is interested in health policy research. He plans on entering a MD-PhD program after spending a research year in Japan.

150 YEARS OF NATIVE AMERICAN RESEARCH AT THE SMITHSONIAN

by JoAllyn Archambault and William C. Sturtevant

[**Editor's Note:** Preserving the past for the future has always been an important mission of the Smithsonian Institution. Within this, Native Americans have held a special place from the beginning as contributors and users of knowledge. The Smithsonian, a great repository of cultural, social, and biological information, has often assisted tribal groups in preserving, strengthening, and renewing knowledge of their own culture and history. In turn, native people have been actively involved in major contributions to the research goals of the Institution. In honor of the Smithsonian's 150th anniversary celebration, *AnthroNotes* presents a short overview of the Department of Anthropology's ethnological and archaeological research on the peoples and cultures of the Americas and native participation in these endeavors.]

The Smithsonian Institution was founded by legislation signed August 10, 1846. Almost immediately it became the leading supporter of anthropological research in America. The first Secretary, Joseph Henry, instituted a series of publications called *Smithsonian Contributions to Knowledge* to record "new discoveries in science." Among the earliest volumes was a report on Indian mounds in the Eastern United States, which demonstrated that they had been built by prehistoric Indian societies, not by some unknown non-Indian civilization as many scholars thought. Other reports based on investigations of prehistoric and living Indian societies soon followed. Along with the published reports, the Institution began to acquire a vast collection of manuscript descriptions and recordings of Indian cultures and languages. The U.S. National Museum served as the repository for contemporary and archaeological Native American collections and works of art. Many of these collections were gathered by Smithsonian staff members and other people, including Native

Americans, and are preserved for exhibition and especially for study to benefit all peoples.

Native American research and the Smithsonian grew rapidly, especially after the founding in 1879 of the Smithsonian's Bureau of America Ethnology (BAE), a research unit independent of the U.S. National Museum that specialized in Native American studies, particularly in ethnology and linguistics. The research of the BAE was preserved and disseminated in several ways. The BAE itself archived the manuscript and photographic results of research. The objects collected by the BAE as documents on both living and prehistoric Indian cultures were preserved by the Museum. The BAE published more than 250 volumes describing Native American cultures, languages, prehistory, and history. Much of the information recorded in these volumes and a great deal of the data preserved in manuscripts and photographs archived by the BAE are documented nowhere else. Without active collecting much of this material would have been lost forever as Indian cultures, societies, and languages underwent rapid changes.



In 1965, the staff and archives of the BAE were merged with the museum's Department of Anthropology, whose primary emphasis was then on archaeology and physical anthropology. Today, the Department continues to focus on Native American studies alongside interests in the peoples and cultures of Asia, Africa, Oceania, and South America, and involves all subdisciplines of anthropology (ethnology, linguistics, archaeology, physical anthropology).

Indian Participation

Research and publication on American Indian languages, literatures, history, and social relations depend on contributions by the people who are the bearers of the cultures. To record, analyze, and describe a language, a literature, a traditional history, a religion, or a system of social relations

requires the cooperation and the active assistance of those who speak the language and possess the knowledge and beliefs that are recorded. In some cases, Native Americans write the information and organize it for publication. In other cases they explain to others who serve as recorders and analysts. Archaeology and physical anthropology are less dependent on the active participation of Native Americans although their insight has proven beneficial. The Smithsonian anthropological staff, from its early days, has included distinguished Indian scholars, among the most important being Francis LaFlesche (Omaha) and J.N.B. Hewitt (Tuscarora). Many other Indians were important correspondents and contributors, although not staff members. Among these were Andrew John (Seneca), Phoebe Maddux (Karak), James Murie (Pawnee), Whewa (Zuni), George Bushotter (Sioux), George Washington Grayson (Creek), George Hunt (Tlingit-Kwakiutl), John Squint Eyes (Cheyenne), George Sword (Lakota), Alfred Kiyana (Mesquakie), Henry Tate (Tsimshian), William Jones (Fox), Isabel Meadows (Costanoan), and Seth Newhouse (Mohawk). Scores of individual members of tribes in all parts of North America have contributed knowledge and information that was recorded by Smithsonian staff members and other contributors to the Smithsonian archives and publications. The Department of Anthropology's staff currently includes two archaeologists of Indian ancestry, and the ethnologist director of its American Indian Program is an enrolled member of the Standing Rock Sioux tribe.

One current project of the Department is the 20-volume *Handbook of North American Indians*, an encyclopedia summarizing knowledge of the cultures, history, and human biology of all the tribes of the continent. Indians have been active in planning this reference work and in writing many chapters; three of the volumes have Indian editors. Since 1978, ten volumes have been published, and the rest are in active preparation.



J.N.B. Hewitt (Tuscarora), ethnologist on staff of BAE, with Andrew John (Seneca), a consultant to the Smithsonian and former president of the Seneca Nation in New York, with a group of visiting Canadian Iroquois. Rear, left to right, William Sandy (Cayuga), Hewitt, Alexander Hill (Onondaga), John; front, left to right, William Henry Fishcarrier (Cayuga), Robert David (Cayuga). Photograph by DeLancey Gill at the Smithsonian, Dec. 1901.

Past and Present Research

Smithsonian anthropologists were prominent pioneers advocating Indian rights and respect for Indian cultures and languages and have remained so. "Anthropologists were among the few who felt that Indian cultures had any value in the late 19th century" says JoAllyn Archambault (Standing Rock Sioux), who directs the American Indian Program of the Department of Anthropology. "They felt that Indian lives and culture had meaning. That is why they wanted to document and save the information and images of our people. And they saved them for future generations of every race."

Anthropologists learned from Indian people and tried, quite successfully, to pass on to others what they learned about the richness and variety of Indian cultures, the complexity and sophistication of Indian thought and belief, the great antiquity of Indian settlement of the Americas, and the thousands of years of inventions and adjustments to the environment. They have continually reminded those

who came later how much is owed to their Indian predecessors, and how much was unjustly taken from them.

One of the first Smithsonian anthropologists was Frank Hamilton Cushing, who lived at Zuni Pueblo in New Mexico for four years in the early 1880s. Learning the language, he was adopted by Palowahtiwa, the Zuni governor, and given a ritual position in the Pueblo. Cushing pioneered the anthropological method of participant observation that was reinvented elsewhere in the present century. After he had compiled a valuable record of Zuni culture, he was recalled to Washington because he had defended the Pueblo against illegal taking of its lands by a politically well-connected outsider.

About the same time another Smithsonian anthropologist, James Mooney, began long-term study of the Eastern Cherokee, recording their historical struggle to remain in their homeland. He collected native curing formulas written in Sequoyah's syllabary and studied the ballgames and other features of Cherokee culture. In the 1890s he conducted a first-hand study of the new Ghost Dance in the West, interviewing Wovoka, the founding prophet. Mooney demonstrated the religious nature of the movement in an attempt to convince the U.S. government that it posed no military threat. He then began an extensive study of Kiowa heraldry (manifested in designs on shields and tipis) in Indian Territory, which he soon was forced to give up as a result of his activities defending participants in the Native American Church.

Working in Washington, D.C. in the latter half of the 19th century, C.C. Royce compiled a detailed study of Indian lands lost throughout the country. The maps he prepared, published by the Smithsonian, served some 50 years later as the fundamental evidence by which Indian tribes were recompensed via hearings held by the Indian Claims Commission.

The first scientifically-based and accepted classification of the historical relationships of North

American native languages was published in 1891 under the direction of J.W. Powell, the founder and first chief of the Bureau of American Ethnology. Much of the evidence for that classification is preserved in the Department's archives; some of it is irreplaceable data on languages that have ceased to be spoken.

In the mid-20th century, Smithsonian ethnologist John C. Ewers wrote the standard text used in Blackfeet Indian schools to teach Blackfeet history. Ewers attributes the success of his research to the Blackfeet elders, born in the middle of the last century, who passed on their knowledge to him.

Today, many Tzotzil Indians in Chiapas are producing a literature in their own language, thanks to the literacy program of the Chiapas Writers' Cooperative encouraged and assisted by Smithsonian anthropologist Robert M. Laughlin. Laughlin has devoted 30 years to research in Chiapas, publishing two massive dictionaries of the Tzotzil language. These provide important evidence used in the decipherment of ancient Maya inscriptions that is revealing the history of this Native American civilization. He has also published several volumes of native literature in Tzotzil as well as in English translation.

Ives Goddard recently published *Native Writings in Massachusetts*, two large volumes that contain all known writings in their own language by its speakers, together with new translations into English and annotations on the grammar and vocabulary. This language, extinct since about 1826, was spoken by the ancestors of the present day Wampanoag Indians of Mashpee and Gay Head.

William C. Sturtevant, general editor of the *Handbook of North American Indians*, researched the cultures and history of the Florida Seminoles and New York Senecas and has over the years provided expert testimony in defense of Indian land rights and in support of federal recognition of Indian tribes. The testimony of Smithsonian anthropologists, behind the scenes and in formal hearings before the courts and Congressional

committees, often has proven helpful to Indian communities. Smithsonian anthropologists, known as objective, knowledgeable authorities on Indian history and Indian cultures, have frequently been called on.

The Arctic Studies Center, established in the Department in 1988 by William Fitzhugh, is an extension of research begun in the 1860s in Alaska and the western part of Arctic and Subarctic Canada. Other early Smithsonian research, both ethnological and archaeological, was carried out among Indians and Inuit in the eastern Arctic. The new Center is involved in research, education, and training of native peoples and the coordination of activities with other government agencies. Fellowships and internships in Arctic and Subarctic studies are available to native individuals. Before the establishment of the Center, Fitzhugh organized major exhibitions of Arctic native cultures at the Smithsonian, which then travelled to other locations, including cities in Alaska. A special version was sent to rural locations making available to Alaskan natives aspects of their own history. Assistance to native museums is a continuing interest of the Arctic Studies Center.

The National Anthropological Archives is the repository for manuscript records on Native American and other cultures and languages, for many thousands of historical still photographs of American Indian subjects (except the photographs of objects in the Smithsonian collections), and for the papers of Indian and anthropological organizations. The core of the Archives are the records and photographs collected by the former Bureau of American Ethnology and the museum department since its beginnings.

The Human Studies Film Archives collects and documents ethnographic moving picture film and video records. It also serves as a clearinghouse for Native American film and video produced by other organizations and makes films and videos available to Indian communities.

The American Indian Program

The American Indian Program of the Department of Anthropology was founded in 1986 to coordinate and increase Native American involvement with the Department. The Program provides outreach to Indian communities and individuals, making the Department more accessible to native people. It encourages research, collection of contemporary Indian objects, exhibitions, and public programming by and about native people. It has initiated numerous programs with reservation based community colleges, tribal museums, tribal education departments and elder groups. Fellows in the American Indian Program are very diverse in age, experience, background, and interest. Their projects have been equally diverse ranging from film research to object collection research by artists to inform their art making. The results of their projects are now used in various community activities in urban and reservation areas. Most recently a group from the Coquille reservation in Oregon found thousands of pages of relevant materials in Washington, had them copied, and has deposited the copies in a local archives where they can be used by tribal members for their own personal research. Several tribes have obtained language materials from the National Anthropological Archives for use in their language programs. Others have used historical photographs to enhance exhibits created for their tribal museums. The Program provides technical assistance to tribal museums and cultural programs upon request.

In July 1997, the Department of Anthropology will celebrate its 100th anniversary, looking back with pride on the Department's many contributions. At the same time, the Department is embracing the future, as the field of anthropology continues to change and with these changes emerge new relationships with Native peoples.

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TAKING IN THE SITES: Anthropology on the Web for K-12

by Margaret R. Dittmore

The Smithsonian's Anthropology Department defines anthropology as "the science that deals with the origins, physical characteristics, and cultural development of humankind" (<http://www.nmnh.si.edu/departments/anthro.html>). The broad scope of this definition means exploring the Internet for related resources can be both exciting and a little daunting. The Internet's tremendous growth in size and popularity has resulted in the need for assistance in navigating it. Offering that help is the immensely popular World Wide Web with which one can locate and retrieve text, pictures and sounds utilizing user-friendly graphics-based point and click browsers. The following list of Web sites is a small sample of what the Internet holds for students and teachers interested in the field of anthropology. It is limited to a few sites (almost entirely U.S.) in each chosen category. Brief annotations highlight their holdings.

A word of caution: At present there are no gatekeepers (e.g., editors, publishers or systems of peer review) for much of what is on the Internet. Sites can be developed by anyone who has the equipment and know-how. As a result, the quality of information is varied. The following sites were selected with this in mind; however, we can not attest to the accuracy of everything presented.

GENERAL SOURCES

Below are several listings of linked resources, sometimes referred to as homepages or virtual library indexes, which will give the reader easy access to those not listed here. They include **Anthropological Resources on the Internet** (<http://www.nitehawk.com/alleycat/anth-faq.html>); European equivalent is <http://lucy.ukc.ac.uk/afaq.html>); **AnthroNet** (<http://darwin.clas.virginia.edu/~dew7e/anthronet>); and **WWW Virtual Library: Anthropology** (<http://www.usc.edu/dept/v-lib/anthropology.html>). Another recently updated

source is the **Anthropology InfoGuide** on the ERIC (Educational Resources Information Center) network (<http://ericir.syr.edu>. Select the Virtual Library). The InfoGuides point K-12 educators to Internet, ERIC, and traditional print information resources on a host of topics. Finally, the Smithsonian's **Office of Elementary and Secondary Education** is also an excellent resource and includes the publication "Smithsonian Resource Guide for Teachers." (<http://educate.si.edu/intro.html>)

ARCHAEOLOGY

To date, archaeologists are the most active on the Internet. There are hundreds of sites to explore! A small sample follows.

***Frequently Asked Questions About A Career in Archaeology in the United States.** Answers questions about education and training, jobs, how to volunteer for a dig, etc. A list of introductory materials (both print and electronic) is also available. (<http://www.museum.state.il.us/ismdepts/anthro/dlcfqa.html>)

***Archaeology Resource Menu.** Extensive listing of linked resources for study/teaching of archaeology. Glossary of terms and a great "Middle School Archaeology Web Unit" included. (<http://www.interlog.com/~jabram/elise/archmenu.htm>)

***Links to the Past.** Information on our collected heritage, participation in archaeology, tools for teaching, and visits to national parks and the lower Mississippi delta moundbuilders (National Park Service). (<http://www.cr.nps.gov>)

***Flints and Stones: Real Life in Prehistory.** Introduction to the world of late Stone Age hunter gatherers through an exhibit of some of Europe's inhabitants and a visit with a shaman. Discuss some misconceptions about the Stone Age, including when these people actually lived. Take a "food quiz" to see if one would survive. (<http://www.ncl.ac.uk/~nantiq/menu.html>)

***Exploring Ancient World Cultures.** An introduction to eight ancient cultures, including the Near East, India, Egypt, China, Greece, Rome, early Islam, and medieval Europe. An "Educator's Resource Page" is available. (<http://eawc.evansville.edu/index.htm>)

***Archaeological Resources Guide for Europe.** A virtual library of European archaeology with over 1,000 links to current work and information resources across Europe! Access is by subject, country (over 30 represented), period, or by database search. (<http://www.bham.ac.uk/BUFAU/Projects/EAW/index.html>)

***Southwestern Archaeology.** Billed as the "type site" for Web archaeology in the Southwest. Includes a reading list, health and safety tips for field archaeologists, and lots of information on sites, museums, collections, institutes, maps, laws, and programs of study accessible by state. (<http://seamonkey.ed.asu.edu:80/swa/>)

***The Inca Trail and Machu Picchu.** A virtual trip up the Inca Trail to Machu Picchu complete with day-by-day descriptions and photographs. (<http://www.tardis.ed.ac.uk/~angus/Gallery/Photos/SouthAmerica/Peru/IncaTrail4.html>)

SOCIAL/CULTURAL ANTHROPOLOGY

***Kinship and Social Organization: An Interactive Tutorial.** A basic guide to concepts of kinship, terminology used, systems of descent and marriage, and residence rules. Diagrams illustrate each. Includes ethnographic examples. (<http://www.umanitoba.ca/faculties/arts/anthropology/tutor/fundamentals.html>)

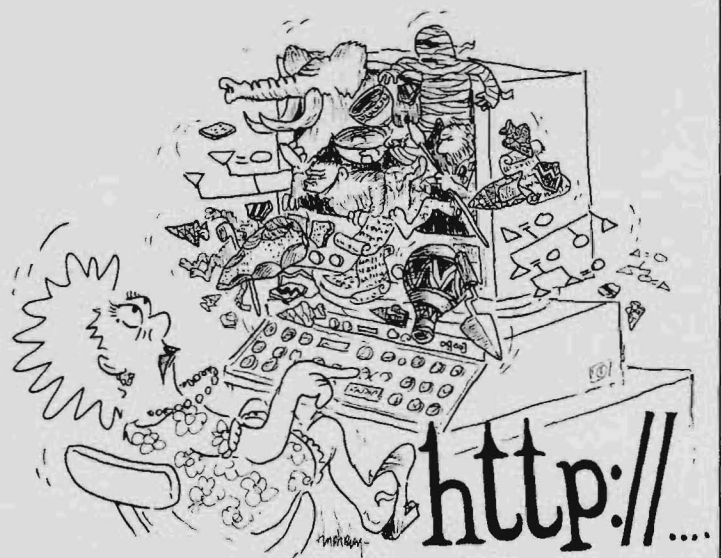
***Folklife Home Pages.** The Library of Congress's **American Folklife Center Home Page** (<http://lcweb.loc.gov/folklife>) offers a Folklife information service with national events, jobs, and training opportunities. Also, an excellent essay titled "American Folklife: A Commonwealth of Cultures." **Smithsonian Center for Folklife**

Programs & Cultural Events (<http://www.si.edu/organiza/offices/folklife/>) features great access to Folkways recordings, including audio samples, and Vfest (Virtual Festival in American Folklife), a cultural celebration in cyberspace.

***Native American Sites.** Access to home pages of individual Native Americans, Nations and other sites about American Indians. (<http://www1.pitt.edu/~lmitten/indians.html>)

PHYSICAL ANTHROPOLOGY

***The Jane Goodall Institute.** Committed to wildlife research, education and conservation. Information about international education programs for youth. (<http://www.gsn.org/gsn/proj/jgi/index.html>)



***Primate Info Net.** Homepage of the Wisconsin Regional Primate Research Center, University of Wisconsin, with links to information resources on primates, primate studies, conservation, etc. Also available are "Primates as Pets," "Primatological Resources for Children and Young Adults" and ASKPRIMATE, an e-mail based reference service. (<http://www.primate.wisc.edu/pin/>)

***Origins of Mankind Homepage.** Recently redesigned, this is an extensive listing of internet resources for the study of human evolution. It includes general origins, sites, theories, online books, prehistoric art and monuments, labs and museums, newsgroups and directories to other sites. (<http://www.dealsonline.com/origins>)

LINGUISTICS

***Ethnologue: Languages of the World.** Catalog of the world's languages with information on alternate names, number of speakers, location, dialects, linguistic affiliation, etc. Browse by country (interactive maps), language family, or any word found in text. 12th edition (1992). (<http://www.sil.org/ethnologue/ethnologue.html>)

***Human-Languages Page.** Language-related resources, including online language lessons, translating dictionaries, academic programs, and other linguistic and commercial resources. (<http://www.willamette.edu/~tjones/Language - Page.html>)

AREA STUDIES

***University of Pennsylvania African Studies Homepage.** Extensive listing of resources for the study of Africa. Includes a very good unit titled "K-12 Electronic Guide for African Resources on the Internet." (http://www.sas.upenn.edu/African_Studies/AS.html)

***Arctic Studies Center.** Activities of Smithsonian anthropologists both in and related to study of the far North. See what it takes to put an exhibit

together, tour a virtual exhibit and an archaeological site, and participate in a repatriation workshop with Alaskan Natives. (<http://www.nmnh.si.edu/arctic/>)

***Asian Studies WWW Virtual Library.** Extensive listing of linked resources for the broad sweep of Asia, including the Middle East and the Pacific. Searchable by region, by 60 different countries/territories, or for Asia-Pacific global data. (http://coombs.anu.edu.au/WWWVL-Asia_n_Studies.html)

***Lanic: Latin American Network Information Center.** Information on 29 countries and 30 different subjects, including anthropology and K-12. Administered by the University of Texas. (<http://lanic.utexas.edu/>)

MUSEUMS

Museums have found the Internet. (See **Guide to Museums and Cultural Resources** (<http://www.lam.mus.ca.us/webmuseums/about.html>) administered by the Natural History Museum of Los Angeles County.) Although many museums have simply produced pages with information about their facilities, hours, etc., others are offering more. For example:

***Canadian Museum of Civilization.** Offers free virtual membership and selective virtual tours of exhibits. Featured are Canada's First People, the British Columbia Coast, a Children's Museum, and Behind the Scenes, etc. (<http://www.cmcc.muse.digital.ca/>)

***Museum of Anthropology, University of Michigan.** A major archaeological research and teaching facility as well as its collections not normally open to the public. Select from among eight curation divisions--ethnology, ethnobotany, Asian, Great Lakes, North America, Old World, New World and Physical. (<http://www.umma.lsa.umich.edu/umma.html>)

***Oriental Institute Virtual Museum.** Showcase of ancient Near Eastern history, art, and archaeology at the University of Chicago. Virtual tours available by subject, gallery or other part of the museum. View highlights from the collections by region (e.g., Anatolia, Egypt, Mesopotamia) and topic (e.g., mummies). (<http://www-oi.uchicago.edu/OI/MUS/QTVR96/QTVR96.html>).

***Smithsonian Institution.** A treasure-trove of resources! Don't miss the **Department of Anthropology** (see introduction), the **Human Studies Film Archives** (<http://www.nmnh.si.edu/gopher-menus/HumanStudiesFilmArchives.html>) or the **National Museum of the American Indian** (<http://www.si.edu/nmai/nav.htm>).

VIRTUAL EXHIBITS

The Internet is a great place for exhibits. Such online displays offer many museums a way to showcase their collections to a wider audience and give all of us an opportunity to share in these experiences. Several current sites include:

***Greek World Virtual Exhibit.** Based on the University of Pennsylvania Museum of Archaeology and Anthropology's permanent exhibit, this site uses artifacts to provide a vivid portrayal of ancient Greek life, including the home, warfare, trade and religion. (http://www.museum.upenn.edu/Greek_World/Intro.html)

***Scrolls from the Dead Sea: The Ancient Library of Qumran and Modern Scholarship.** Based on the Library of Congress exhibit. Includes images of 12 scroll fragments and 29 objects, a description of the Qumran Library and its community and a discussion of the scrolls today, 2,000 years later. Also available are "Resource Materials for Teachers." (<http://sunsite.unc.edu/expo/deadsea.scrolls.exhibit/intro.html>)

***Exhibits On-line.** Selected online exhibits from the Peabody Museum of Archaeology and Ethnology (Harvard University), which houses

prehistoric and historic collections from all over the world. Currently featured are **Against the Winds: American Indian Running Traditions**, **Three Generations of Women Anthropologists**, and **The Children of Changing Woman**. (<http://fas-www.harvard.edu/~peabody/maria/index.html>)

ELECTRONIC PUBLICATIONS

At present only a few anthropological periodicals have attempted full-text online. (For example, see online version of **AnthroNotes**.) Instead, the majority offer information about the journal, how to subscribe or submit an article, and tables of contents for recent issues (some with abstracts of articles). An example is the journal **Archaeology** (<http://www.he.net/~archaeol/>) that also has an excellent set of links to archaeology around the world. For an example of online text, see John C. Ewers' **Hairpipes in Plains Indian Adornment** (<http://www.sil.si.edu/electedns.htm>) published by the Smithsonian Institution Libraries as part of a larger electronic publishing project.

PROFESSIONAL ASSOCIATIONS

A growing number of professional organizations are discovering the Internet as a good way to reach out to their membership and to advertise to new and interested others. Among them are the **American Anthropological Association** (<http://www.ameranthassn.org/>) whose homepage is currently under construction and the **Society for Historical Archaeology** (http://www.azstarnet.com/~sha/sha_ha2.htm), which has special sections on what historical archaeology is, careers and graduate programs in the field, and information for kids titled "Kids! Is the Past in your Future?"

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AnthroNotes offers in-depth articles on current anthropological research, teaching activities, reviews of new resources, and an annual article on summer fieldwork opportunities. *AnthroNotes*, originally part of the George Washington University/Smithsonian Institution Anthropology for Teachers Program funded by the National Science Foundation, is published free-of-charge, three times a year (fall, winter, and spring).

AnthroNotes has a three part mission:

- 1) to more widely disseminate original, recent research in anthropology in order to help readers stay current in the field;
- 2) to help those teaching anthropology utilize new materials, approaches, and community resources, as well as integrate anthropology into a wide variety of curriculum subjects; and
- 3) to create a national network of anthropologists, archaeologists, teachers, museum and other professionals interested in the wider dissemination of anthropology, particularly in schools.

To be added to the mailing list, write: Anthropology Outreach Office, NHB 363 MRC 112, Smithsonian Institution, Washington, DC 20560. This newsletter with its cartoons may be reproduced and distributed free-of-charge by classroom teachers for educational purposes. *AnthroNotes* is now available on America Online (keyword: Smithsonian→Publications→Natural History Publications).

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