

### COMPUTER USES IN ANTHROPOLOGY

The on-going evolution of computers is producing tools for anthropologists that greatly improve the speed and the breadth of analyses in cultural anthropology. Word processors have replaced the fountain pen for capturing interview data, and new ethnographic computer programs allow researchers to explore important aspects of cultures at great depth. Participant observation results in the collection of large volumes of descriptive data about people's lives. These data can be captured in computer-based field notes, transcriptions of interviews, drawings, charts, tables, and the other types of files that ethnographers mold into an ethnographic data base. The other raw ethnographic data resources, such as tape recordings, videos, and still pictures can be loaded into coded computer files, using either scanners or the newly emerging CD-ROM technology to record the information. CD-ROM files are capable of storing entire dictionaries, collections of published ethnographies, encyclopedias, and a museum full of works of art, with room left over for music compositions and three-dimensional reproductions of artifacts. Ethnographers can have virtually instant access to the mountains of raw data they previously had to laboriously sort and classify by hand.

#### ETHNOGRAPHIC DATA COLLECTION AND MANAGEMENT

One important anthropological use of computers is to manage and analyze field notes and interviews. Ethnographers use word processors to record their observations of everyday life, to transcribe interviews with key informants, and to keep their field notes up to date on a daily basis. Once the data are available on disk, there are programs which allow anthropologists to code it, retrieve it for analysis, and publish the results.

Anthropologists who have ethnographic field note files that were not saved on computer often use simple data base programs to help manage and analyze their data. These programs provide textual and numeric fields in a matrix format. The user can decide on the content of each field, and then do quick, accurate computer-assisted searches to review and analyze their data. These programs can search cross-references about the person being interviewed, specific interview content, or any other important characteristic asso-

ciated with each part of the text. The researcher can use these programs to compare text between different people and can retrieve key quotes and information from ethnographic data quickly. These programs can also be used to explore relationships in large existing data bases, such as the Human Relation Area Files, for many different types of cross-cultural research endeavors.

There are now ethnographic data management programs available for IBM, Macintosh, and Unix computer systems. They are designed to allow researchers to combine their ethnographic text with coding and analysis programs that handle the specific needs of ethnographic analysis. The purpose of these programs is to interactively code segments of text for future reference, to search the data, analyze it, and cut and paste important text segments into articles for publication. This process frees the ethnographer to spend extra time on analysis rather than on repetitive, time-consuming mechanical labor prior to analysis.

#### ADVANCED METHODS AND RAPID ASSESSMENT TECHNIQUES

There has been a significant expansion in computer assisted ethnographic techniques over the past five years. These methods are predominantly focused in two areas of cultural analysis. First, anthropologists have become prolific in creating methods that allow us to explore cognitive domains. These techniques include those that (1) assist in determining the content and limits of domains, (2) analyze the structural elements of domains, and (3) portray a domain from a consensual framework. Second, they have significantly improved our ability to explore culture beyond the level of the individual by creating new techniques to analyze social groups and networks.

The free listing technique is one of the most common processes used to explore a culture. In one form or another, the technique has been used by every ethnographer who wanted to investigate the limits of a cultural area of knowledge, belief, or behavior. The basic approach is to ask informants to list all of the things that are part of a particular cultural area. These simple lists were previously laborious to analyze, but if the raw data is typed into a computer file, there are computer programs that allow them to be pro-

cessed quickly. Some of the more sophisticated forms of free listing data analysis use statistical procedures to correlate informant information to free listing choices. This creates the opportunity to analyze relationships such as cultural orientation, intracultural variation, gender differences, or economic and educational differences based on sex, age, income, educational level, and other culturally significant factors.

Cognitive anthropology research methods that were previously extremely tedious but useful (e.g., pile sorts, triads tests, dyads tests, etc.) have been transformed into easily accessible methods through the adoption of the micro-computer as a fieldwork tool. Each of these techniques begins where free listings leave off. They allow the researcher to explore the relationships among the key elements of a domain. The basic research is accomplished by asking informants to judge the similarities and differences of domain elements to one another. For example, the "pile sort" technique uses visual aides to allow informants to create unconstrained classifications of elements within a cultural domain. The most common method is to ask people to sort pictures, real objects, or key concepts into piles. The final amalgamated groupings (sorted piles) of all informants represent the cognitive typology of the domain. This information can be analyzed by ethnographic programs which create a comparison of the variables using a distance matrix. The matrices can be analyzed using statistical techniques that transform the numbers into a visual representation of the relationships of elements in the domain. This process can produce a cultural typology or can identify hidden structures in the data, enhancing the larger ethnographic analysis of the culture.

Consensus theory is a method that allows an ethnographer to explore consensual descriptions of a cultural domain, while simultaneously assessing individual informants' expertise. Consensus theory models of culture are developed by creating a formalized set of questions that meld ethnographic survey questions with a formal mathematical model based on approaches used by psychometricians in test construction, influenced by latent structural analysis procedures. Consensus theory is designed to work with a common condition in ethnography: the situation where we know the correct questions to ask, but do not know which are the correct, or the most culturally correct, answers to the questions. Computers allow ethnographers to transform answers to these types of questions into a model of a cultural area.

Anthropologists have been interested in the effects of social relationships on human cultures for a very long time. Harold C. Conklin's ethnogenealogical method is an example of an early method for creating kinship-based models of social relationships in a culture. This type of research can now be assisted by computer programs which that allow the researcher to track and explore genealogical information and to create models of kinship systems.

Anthropological research has also pursued increasingly sophisticated examinations of informal and formal human networks. Modern network analysis provides computer techniques for expanding our knowledge of the effects and dynamics of non-kin networks in all parts of human cultures. Ethnographers are conducting network mapping, ego-centered data collection, and reciprocal relational data collection networks using computer technology. These network analyses can be based on observations, interviews, or both, and often include both quantitative and qualitative measures of interaction, social relationships, and changes over time. They provide information on communications patterns, influence, cliques and factions, strong versus weak relationships, and other important measures of small-group dynamics. Each of these approaches can be valuable in helping cultural anthropologists understand human behavior and human organization.

### TEACHING ANTHROPOLOGY WITH COMPUTERS

There are three areas where computers are enhancing the educational opportunities of anthropology students. These include the use of anthropological resource data bases in undergraduate and graduate classes, the development of anthropological teaching programs (computer assisted instruction programs), and the construction of computer laboratories for undergraduate and graduate students. These three types of resources provide many different types of hands-on experiences for students who want to work with cultural materials or anthropological data that would be difficult to gain access to without computers.

There are a number of anthropological and other cross-cultural data bases that are being made available as classroom resources for anthropological education. These include national and international bibliographies; comparative cross-cultural data bases on lifestyles, demographics, and cultural patterns; and ethnographic and archaeological reports from around

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the world. The bibliographies that are now available on computer allow students access to information that was previously available only through extensive searches in research university libraries. These bibliographies can be purchased for single cultures, for world cultural areas, or for specific topics of interest to students and faculty. Some are maintained on line and can be accessed through Internet electronic mail connections. These resources change constantly, as do the individuals and companies who make them available. Cross-cultural data bases are available commercially, and from individuals who have developed data bases on specific cultures, or on broad culture areas and/or topics (such as kinship, economics, health issues, development). Until a more stable system for distributing these resources is available, the best way to gain access to them is to contact the reference librarian at a research university library, search through the current anthropological Internet discussion groups, or contact a local anthropology department for information about faculty who utilize these types of resources.

Some of the anthropological data bases, such as those available from the Human Relations Area Files, Inc., include both qualitative and quantitative data sets. This information is then used to complete class assignments, write term papers, or conduct cross-cultural analysis for classroom discussions. There are also a rapidly growing number of data sets that can be used in the classroom, or by students, to study material culture. These include CD-ROM packages that can provide a data base on architecture in various cultures, or thousands of photos and drawings of clothing, furniture, tools, food, people, and daily activities that can be woven into classroom and homework exercises in cross-cultural comparison and a broader awareness of cultural differences and similarities for basic anthropology courses.

There are an increasing number of teaching programs that can be used in conjunction with more traditional anthropological educational methods, for both undergraduate and graduate courses. These programs allow the instructor and the student to simulate cultural processes, such as the evolution of the high status of women in Tongan society, or the decision to use commercial fertilizer in an African economic development program. These programs provide the student with the background information necessary to understand the elements that are impor-

tant within a culture system, and then to make decisions or to observe the changes that occur within a simulated society, based on those rules. This has the advantage of teaching students about cross-cultural differences, without having to deal with the logistics of cross-cultural research. For many of these issues, it provides an interactive educational opportunity that is not available through any other type of classroom resources.

Finally, most anthropology programs now provide access to anthropological computer laboratories for their undergraduate and graduate students. These laboratories are both teaching and research facilities. They allow undergraduate students to participate in ongoing research projects, they support faculty research efforts, and they allow graduate students to have access to the key computer resources. These resources include computer hardware and software. The hardware consists of state-of-the-art personal computers loaded with anthropological software and attached to peripheral devices that support both the research and the educational functions of the laboratory. Ethnographic and other anthropological data bases and programs tend to require large-capacity storage (hard drives and CD-ROM capabilities), and rapid processing times to support computer graphic capabilities for both audio and video data. The most common peripheral additions to anthropological computer laboratories include scanners that can process and store the photographs and drawings that are a common part of anthropological data, along with plotting or bitmapping peripheral hardware that allows accurate map-making and drawings. Audio tape (interview data) and video input devices (peripherals that can convert audio and video tapes to digital computer information) are increasingly important anthropology laboratory equipment.

One of the main reasons that anthropology departments are supporting their own computer labs is that they provide student and faculty access to excellent anthropological software that is specialty software compared with the programs normally found in generic computer labs, as well as access to general social science software (e.g., statistics, mapping, etc.), as well as word processing and presentation (graphics) software. Multimedia and textual data can now be handled by third-generation ethnographic analysis software programs, as well as by data presentation programs. Anthropologists use both qualitative and quantitative

analytical software, and they need access to software that allows them to present multimedia (text analysis, photos, video, and direct quotes) information as a part of a scientific presentation of their findings at meetings or in the classroom.

In addition to the ethnographic analysis software, most anthropological computer labs provide OCR (optical character reading) software that allows textual data from books, articles, and printed materials to be scanned into anthropological computer data bases for analysis. They include a variety of mapping software programs—both GIS (geographic information system), and commercial mapping software, e.g., street maps and county demographics—that can be used for different types of anthropological research. They also provide statistical packages, spreadsheets, and various types of data base programs (both numeric and textual) that are part of an integrated analytical system for both qualitative and quantitative anthropological data sets. There are a wide number of choices for each of these types of software, all of which are effective, depending on their use and the preferences of the faculty and students. Since these programs change rapidly, and new ones are added on a regular basis, specific software should be tested, updated, or replaced on a regular basis.

The final software resources found in most anthropological computer laboratories include word processing programs for data entry and write-up, and communications software that allows electronic mail communications and Internet access (for data bases, communication, and general information transfer). The laboratories also normally provide support services (training on specific programs and hardware) and maintain resources that greatly reduce the data storage, management, and retrieval burdens that formerly slowed many types of anthropological research efforts.

### OTHER DEVELOPMENTS

The processes and resources listed above are not the only uses for computers in cultural anthropology. CD-ROM technology has great promise for allowing anthropologists to conduct sophisticated statistical and qualitative comparisons of existing ethnographic data bases at levels that have not been attempted before. Linguistic analysis can be greatly enhanced by computers, ranging from the construction of simple concordances and key-work-in-context files, to sophisticated sociolinguistic analysis of power relation-

ships, speech patterns, cultural modeling, and the subtle effects of language on culture. Computers are assisting in material cultural data collection, storage, and analysis, from computerized mapping systems to three-dimensional artifact analysis, using advanced computer graphics programs. Computers have also become important in the analysis of relationships between human biological processes and culturally shaped behaviors, such as rituals and kinesiology, or trance and healing. This research is conducted by merging ethnographic computer technology with modern audiovisual, physiological, and other biological forms of data collection. Taken all together, computers have become an indispensable tool for all areas of cultural anthropology and they will allow us to create new forms of integrated or holistic anthropological research for the future.

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*SEE ALSO:* *Computers and Culture; Componential Analysis; Cyberculture; Education; Fieldwork; Linguistic Anthropology*

## CONFLICT AND AGGRESSION

In the social sciences, the terms "conflict" and "aggression" generally are not used interchangeably. Usually the term "conflict" refers to perceived divergent interests between two or more parties. Even though the term "aggression," in popular usage, has a plethora of uses—ranging from an "aggressive" insurance salesperson to the "aggressive" death squads—social scientists tend to be more restrictive, many defining "aggression" as acts that inflict harm (physical, psychological, and/or social) on another person.

Anthropology provides insights into conflict and aggression that pertain to conceptual issues, cross-cultural variation, controversies over the relative influence of biology and culture, transmission of conflict, and sex/gender differences.

Since divergent interests among individuals and subgroups of individuals are natural consequences of sociality, conflict can therefore be considered an inevitable feature of social life. Conflict, however, does not inevitably lead to aggression. Conflict can be dealt