INTRODUCTION: KEEPING IT REAL IN THE APPLICATION OF THE NEW TECHNOLOGY

By Ian Skoggard

There is no stopping technology. The incorporation of computers as a research tool into anthropology is inevitable. The Luddite in us wants to lash out against this intrusion. The alternative is to meet the challenge head on and tame the beast in our own way. The papers in this special issue on modeling reveal how this latter process is possible and ultimately successful. Practicing anthropologists have been leading the way. Their engagement in modeling is not a sign that they have gone over to the other side but rather have been able to adapt modeling to meet anthropological ends. They have been humanizing the machine, making computers respond to their understanding of culture. The discipline's integrity has been maintained.

As my father was fond of saying, computers are only as smart as the programmers who program them. If anthropologists are to use computers in their research, then it is incumbent on them to program them as anthropologically savvy as possible. Anthropologists now have much to contribute in this regard as computers and programs are becoming more sophisticated and powerful to simulate the more complex social relationships and interactions that constitute cultural behavior. It is this increased power of computers that has opened up computational social sciences to anthropologists. It is a specialized field that requires first the available hardware and next the necessary technological knowledge or willingness to collaborate with specialists. All the authors in this guest-edited section of this issue discuss the give and take between anthropologist, programmers, and clients or stakeholders and between the ethnography, ethnology, and the programming software to achieve a more culturally nuanced model.

Modeling has become a tool for interdisciplinary collaboration, which is addressed by some of the papers. The seemingly impartiality and objectivity of the computer renders it a trusted tool for collaborative research. However, the process of programming the model demands conceptual clarity and specificity which can challenge researchers, including anthropologists, who are accustomed to seeing the world through their own methodological and theoretical lens. For the sake of communication, anthropologists are forced to think outside their disciplinary box and translate concepts into language more accessible to researchers from other disciplines and more applicable by programmers. Such self-reflection is not new to anthropologists, who are compelled to rethink and articulate a new anthropological concept each time they step into the field.

This special issue on modeling evolved from the original panel, "Using Models in Socio-ecological Research: Promises and Pitfalls," organized by Bryan Tilt from Oregon State University for the 2011 Society for Applied Anthropology Meetings in Seattle. Tilt's original call for papers and session abstracts included the provocative statement by systems engineer George Box, "All models are wrong; some models are useful." Modelers are fully aware of the limitations of their methods; however, they also realize that models are nevertheless useful. Just how useful is the question the reader can decide for her or himself. Three papers from that original session are included here, those by Tilt and Schmitt, Skoggard and Kennedy, and Fischer et al. The three other papers by Schensul, Hoffer, Andrei, and Kennedy were solicited afterwards. No attempt is made in this special issue to represent the full range of modeling efforts being made by anthropologists. Nor is this a history of computational anthropology, although Andrei and Kennedy do review two of the earliest computer models in anthropology, Lansing and Kremer's model of Balinese irrigation systems and Agar's Drug Talk model. Rather, this issue is a mere sampling of some of the models in use in applied anthropology and how these models have been developed and adapted to serve anthropological ends.

The six papers in this issue are written by applied anthropologists from both inside and outside the academy. All involve interdisciplinary and interinstitutional collaboration; and all have policy-making implications. Clients include the Institute for Community Research, National Institute for Research in Reproductive Health, Office of Naval Research (ONR), and the United States Department of Agriculture (USDA)—Forest Service. Three were collaborative projects funded by the National Science Foundation (NSF), and the other two by ONR and the National Cancer Institute along with the United States Fogarty Center. The area foci of the papers includes Africa, China, India, and United States. Subjects range from regional conflict, smokeless tobacco use, heroin use, dam construction, and forest management. A tangential goal for all the projects was the development of the model itself. Because of the short history of computer modeling in the social sciences, there is still much work to be done building models suitable for social science research. Some authors report that their models are still a work in progress, achieving only partial results.

In their paper, "The Integrative Dam Assessment Model: Reflections From an Anthropological Perspective," Tilt and Schmitt use a computer model to assess the biophysical, socioeconomic, and geopolitical impact of dam construction. The challenge of this model was to include and evaluate all the different stakeholders in the assessment and accommodate their various needs and values. The model here becomes a vehicle for different stakeholders to consider and appreciate the interests and values

of other stakeholders and "become aware of their own subjective biases." The model is a means by which the stakeholders arrive at a mutually agreed upon plan which becomes a more sustainable project in the end because the needs and concerns of all those affected by the project are addressed.

Similarly, the model developed by Fischer et al. in their article, "Using the Forest, People, Fire Agent-Based Social Network Model to Investigate Interactions in Social-Ecological Systems," attempts to find common ground between two stakeholders with two opposing cultures surrounding forest management: those who favor burning and those who do not. Their model brought both groups together to show the consequences of either approach in the effort of finding a middle way of collaboration between private and public sectors. Interestingly, both the above papers discuss an important purpose of their model, which is to bring stakeholders together and address their respective interests and views. This is applied anthropology at its best, sensitive to all stakeholders and playing a mediating role between them.

Skoggard and Kennedy, in their paper, "An Interdisciplinary Approach to Agent-Based Modeling of Conflict in Eastern Africa," focus on the interdisciplinary collaboration between computational social scientists and anthropologists in the effort to build an agent-based model (ABM) of conflict in East Africa. For the anthropologists, the programming of the behavior of agents is basic ethnology and requires patience. There are many layers to the model, and it takes time to build them up, each layer requiring testing and an exhaustive process of trouble-shooting. For anthropologists with the patience to pursue this route, seeing patterns emerge from simple rules of behavior is gratifying.

Hoffer looks at the heroin trade in his paper, "Unreal Models of Real Behavior: The Agent-Based Modeling Experience." By choosing an agent-based model, he was able to show his clients the important role of "copping" drugs had in the pricing and consumption of drugs, which had defied normal market expectations that higher drug costs would produce less demand. This economic misunderstanding of the drug market had been the basis for the war on drugs policy: reducing supply forces prices up and thereby reduces consumption. However, the war did not reduce drug use, and Hoffer's model was able to supply one reason why this might be so. The emergent properties of an ABM are clearly demonstrated in this study, revealing patterns that emerge from basic rule-governed behaviors of individual agents.

Schensul's paper, "Building a Systems Dynamic Model of Smokeless Tobacco Use in Mumbai," is concerned with the health consequences of smokeless tobacco use on pregnant women. Her study focuses on what factors contribute to increased use. The study examines and identifies the multiple factors that might influence smokeless tobacco use, including advertizing, number of retail outlets, peer influence, and government legislation. However, the original linear model used by Schensul and her team could not account for the variation in tobacco use noted across communities. She had to abandon the first model and construct a second more dynamic model. In this case, if the model was wrong, it was abandoned, and one more faithful to the real-life situation was developed. Such flexibility is a testament to the integrity of the researchers.

Choosing the right model matters. Schensul writes about linear and dynamic models (SD), the former involving simple causal chains while controlling most other variables. SD models allow for multiple variables at play which can then produce various outcomes over time depending on how parameters are set. Agent-based models used in three of the studies are examples of the latter. Hoffer distinguishes between three types of ABMs: abstract, middle range, and facsimile, which range from the general and theoretical to the more specific, case-like study. The theoretical shift in ecology from an equilibrium to open system perspective has opened the way for system dynamic and agent-based models. Norms, rules, values, and environment are the programmable pieces of the model that when put into play produce an emergent, historical-like outcome, which becomes the object of the study.

In their paper, "Agent-Based Models and Ethnography: Combining Qualitative and Computational Techniques with Complexity Theory," Andrei and Kennedy review two historical anthropology computer models. One is a model based on Stephen Lansing's original ethnography of Balinese irrigation systems. The model bolstered Lansing's earlier findings about the agricultural productivity and sustainability of the irrigation and associated temple networks. Furthermore, the model was able to sway policymakers not to interfere with the traditional system in spite of Green Revolution pressures. The other model is by Michael Agar, a veteran in the field of applied anthropology and computer modeling, whose model of drug use is informed by many years, indeed a life's work, of ethnographic fieldwork. Andrei and Kennedy also provide a useful guide to starting up an ABM model.

It is clear in all these papers that modeling does not replace fieldwork. Indeed, ethnographic data are key to programming the model. In several projects described here, initial fieldwork had to be done, qualitative interviews carried out, and variables identified. In other projects, the previous work of ethnographers had to be consulted. Schensul's study will require a second period of fieldwork to investigate what the model revealed. Agar's modeling career is a demonstration of how ethnography is used again and again to correct and refine models. Also, it is interesting to discover that these papers albeit about computer models also discuss what is going on among the modelers and stakeholders themselves. The communication between diverse groups promises a broader understanding of the problems at hand and more comprehensive and inclusive solutions. From these papers, we get a good sense of anthropology being practiced at its best, bringing anthropological knowledge and perspectives to bear on complex social issues and methods. By no means is anthropology being compromised. So check any doubts you may have at the door and read on! ■