ozkem področju, ne uspe pa slediti literaturi v bolj širokem obsegu. Svoje učence sem spodbujel k učenju tujih jezikov in jih uvajal v dogajanja v svetovni arheologiji.

Arheo: *In vprašanje za zaključek: kakšni so zdaj Vaši načrti?*

L.K.: Najprej izdati rokopise, ki dolgo niso mogli ugledati luči v SSSR in niso mogli v zamejstvo, posebej izdati popolno izdajo knjige *'Fenomen sovjetske arheologije'* in knjigo *'Spor o Varjagih'*. Potem so tu še manj ostri rokopisi, ki mi jih prej ni uspelo izdati - zaradi nerazpoloženja samega avtorja. Tako ni bila tiskana moja *'Nova arheologija'* - po mojem mnenju ni zastarela. Poleg tega sem v času, ko sem bil izobčen iz arheologije, napisal dve knjigi o kritiki Homera, zdaj sta v založbah v Moskvi in Leningradu. Posamezna poglavja so bila že objavljena v časopisih in prejela zelo visoko mnenje zelo cenjenega znanstvenika: I. M. Djakonova. Povedal je, da bodo ta dela označevala začetek nove epohe v homerologiji. Tako da z nestrpnostjo čakam izid teh monografij. Pišem knjigo o splošnih kulturnih izvorih Grkov in Arijcev, te izvore vidim v eneolitiku naših step.

No, in končno so z letošnjim letom na zahtevo študentov obnovljena moja predavanja na Leningrajski univerzi. Imam tudi povabila iz tujine. Tako da imam veliko dela. Škoda le, da so se nove možnosti pokazale tako pozno - zdaj mi je že več kot 60 let.

Arheo: *Izgledate izjemno mladi.*

L.K.: Včasih. Veste, še zdaj se po stari navadi ogovarjam: *"mi, mladi raziskovalci..."*, *"nam, mladim..."*. Potem se nenadoma spomnim: to ni namenjeno nam. Namenjeno je njim. In vendar se psihično počutim bližje mladini, kot starim rodovom.

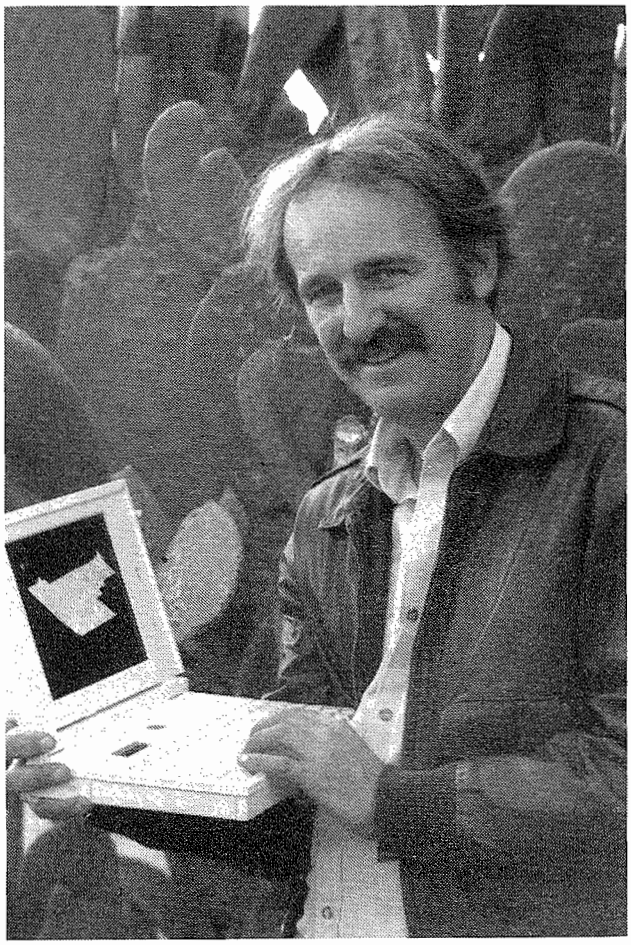
Arheo: *Verjetno je to posebnost ustvarjalne osebnosti. Želim Vam, da se uresničijo vsi Vaši načrti.*

L.K.: Hvala za dobre želje.

Opomba

1. Intervju je bil opravljen pred tremi leti ob Klejnovem obisku v Berlinu.

Za Arheo je spraševala *Biba Teržan*
Prevedla: *Mojca Plevel*



Institutum Studiorum Humanitatis (ISH) - Evropski center za humanistične študije ter Oddelka za arheologijo in sociologijo ljubljanske Univerze so organizirali tritedenski podiplomski tečaj z naslovom *Geografski informacijski sistemi in arheologija pokrajine*. Geografski informacijski sistemi (GIS) so relativno nova tehnologija shranjevanja, manipuliranja, obdelave in prezentiranja prostorskih podatkov, ki prinašajo pomembne spremembe v možnostih razumevanja in analiziranja interakcije človeka in prostora v preteklosti. Dejstvo je namreč, da se je GIS tehnologija relativno hitro udomačila v tehničnih in naravoslovnih strokah, medtem ko družboslovje, tako kot ponavadi, pri aplikacijah zaostaja. Upati je, da je s tem študijem razširjeno poznavanje GIS v humanistiki, predvsem pa v arheologiji.

Dvanajstim slušateljem intenzivnega, 105-urnega tečaja, ki se je pričel 22. junija 1992 in ki ga je vodil profesor Kenneth Kvamme iz Univerze v Arizoni, ZDA ob pomoči asistenta Zorana Stančiča, so bili predstavljeni osnovni koncepti geografskih informacijskih sistemov, teoretični pristopi geografskih in arheoloških prostorskih analiz ter izhodišča t.i. arheologije pokrajine. Študij je temeljil na vrsti praktičnih primerov iz arheoloških raziskav. Tečaja so se udeležili arheologi in geografi iz Anglije, Avstrije, Belgije, Južne Koreje, Srbije in Slovenije. Finančno podporo za izvedbo so zagotovili Ministrstvo za znanost in tehnologijo, Ministrstvo za šolstvo in šport, Zavod za usposabljanje invalidne mladine, Kamnik ter Ameriški kulturni center v Ljubljani. Kenneth Kvamme je eden najbolj priznanih strokovnjakov s tega področja. Objavil je vrsto publikacij na temo kvantitativne arheologije, tehnik terenskega pregleda, in severnoameriške arheologije. Zlasti je znan po svojem delu na področju aplikacij geografskih informacijskih sistemov v arheologiji. Ker smo mnenja, da njegove izkušnje lahko predstavljajo koristno informacijo tako o operativnem izvajanju raziskovanj kot tudi o sistemu arheološkega izobraževanja nasploh, smo z njim pripravili kratek intervju.

ARHEO: *The course 'GIS and Landscape Archaeology' is finally over. We hope that you have enjoyed your visit here in Slovenia. What are your impressions about the course and Slovenia?*

K.K.: Everyone is happy that the course is now over. Although we developed a great camaraderie and learning experience, we worked seven or eight hours a day for three weeks. I think everyone is exhausted now. I was concerned that with the intensity and duration of the course some of the students might drop out, but none did. In fact, all 12 of the students agreed that they learned a lot and enjoyed it! This was because the overall caliber of the students was very high. We also put a lot of focus on the social part of the course-parties, trips-which helped to keep moral up, and this worked out great.

A big part of the success of the course stemmed from the organizational support from the University. Working with Drs. Stančič and Saksida was pure pleasure. The facilities and equipment provided by the University were excellent. Finally, I found the setting of the course near downtown Ljubljana to be a great choice. I enjoyed the old town center very much.

ARHEO: *It is rather exceptional that an archaeologist would have such a specialized knowledge of what are considered to be technical disciplines like GIS and statistics. Can you explain how this came about?*

K.K.: I became interested in quantitative methods first. As an archaeology student I received the usual traditional training, of course. I also endeavored to obtain field experience all over the western U.S., including several years as an excavator on Smithsonian Institution projects with Dennis Stanford, and I worked in Alaska, Mexico, and Germany. It wasn't until Master's level graduate work at Colorado State University (1975) that I began to question the purpose of obtaining all these data from fieldwork and what could be done with it.

Two professors were particularly influential in shaping my thoughts during this period. Russell Coberly, a cultural anthropologist, espoused the idea of a unified Science of Mankind which focused on patterns, regularities, and generalizations dealing with all people, in all places, in all times-hence, archaeology played an important role. Kenneth Berry, a quantitative sociologist, showed me the importance of looking at patterns in real data, the possibility that statistical techniques could offer new insights and, moreover, that these methods would lend a degree of objectivity to research findings, a weakness that even then I could perceive in archaeological writings. Simultaneous with all this the radical 'New Archaeology' movement was going strong. Led by people like Binford, Flannery, Plog, and Schiffer, it preached doing archaeology in a different way. They wanted to make it more rigorous, scientific, problem-oriented, and with a goal of developing generalizations or even 'laws' about regularities in past behaviors.

Being young and impressionable all this profoundly influenced me so I decided to acquire what I perceived to be appropriate scientific tools for doing this sort of archaeology: mathematics and statistics. Classes in these topics further supported my perspective by making me aware of the quantitative revolution on-going in the behavioral sciences and the new research possibilities they offered. This background convinced me that with proper methods and research plans the sites and artifacts left

behind by past peoples could be made to speak to us in a much better way. My Master's thesis, directed by Elizabeth Morris, was a radical departure for that department; it wasn't a traditional excavation report but utilized multivariate statistics to develop paleodemographic models for pueblo sites in the American Southwest.

ARHEO: *That explains your quantitative background, but how did you get involved with GIS and how was all this related to your work in archaeological predictive modeling?*

K.K.: My involvement in GIS and archaeological locational modeling may be the result of pure coincidence. I actually got involved in the modeling problem first and then learned of GIS as a way to automate it.

For several years after my Master's I worked in archaeology for government agencies or private contractors. Although I gained much experience I became bored with the same sort of projects and descriptive reports that precluded any chance to express creativity. The break in this tedium came in 1979-80 with a large contract awarded by a federal agency that called for a random sample survey of a 2,300 sq. km region in central Colorado together with the development of a model that could 'predict' where future sites might be found based on survey data.

I employed a new research plan that turned out to work very well. We measured a series of environmental variables at each of the 60-odd discovered sites thought to be important to the locations of these hunter-gatherer camps (e.g., distance to water, elevation, gradient, environmental type). We also measured the same variables at more than 100 randomly located points where it was known by our survey that sites were absent. I then could statistically compare and contrast environmental differences between site-present and site-absent locations to learn something about the prehistoric site location selection process. Our model was simply a two-group multivariate discriminant function. Cultural resource managers at our sponsoring agency could select a locus on a map, measure on the map the required six variables, and then insert the measurements into the function to obtain an estimated probability of site presence at the locus (I actually programmed a calculator to do the mathematics so they only had to enter the environmental data). They really liked it. Some of our test statistics showed that the accuracy rate was about 85 percent for known sites. Better still, this project motivated me to return to University for my doctorate.

ARHEO: *So you developed a methodology for archaeological predictive modeling, but without the use of computers! We take it that GIS was the next step.*

K.K.: That is correct. I went to the University of California at Santa Barbara in 1980, not knowing anything about GIS, or computers for that matter (aside from SPSS, a common statistical program). I went there specifically to study under Michael Jochim, whose then recent book *Hunter-gatherer Subsistence and Settlement: a predictive Model* I found strongly appealing, and Albert Spaulding, whom I think can be accurately labeled as the father of statistics in archaeology. My choice of Santa Barbara was extremely fortuitous. I intended my doctoral project to continue my Colorado locational modeling work and it was right there, in Santa Barbara's Geography Department, that many of the initial seeds that later grew into GIS were being planted. I studied computers in earnest, spent much time in the Geography Department, and under Spaulding's guidance took more statistics classes including several under Lawrence Hubert, a renown spatial statistician.

From the geographers I learned about GIS possibilities although there was no good software at that time. We used as a shell the VICAR/IBIS image processing system that you could link specialized FORTRAN subroutines with to do GIS kinds of things. The biggest problems with my archaeological modeling work were in automation: (1) obtaining the relevant environmental measurements at a location, (2) computing the discriminant function probability for the location, (3) mapping the probability and (4) repeating steps 1-3 systematically (e.g., every 50 m) across huge regions to generate archaeological locational model surfaces. My Ph.D. involved writing computer programs to resolve these difficulties. Some of the programs included computation of gradient, aspect, distance-to-water, a view measure, and local relief from digitized elevation and stream data. My Ph.D. dissertation (1983) was successful in the application of these

programs to a 50 sq. km region involving seven variables, each measured at 5,000 points.

It was during my first post-doctoral position at Denver University (1983-85), however, that I was finally able to hone my GIS expertise to a high level. I was hired principally to create and manage a large computer database for a 1,000 sq. km project in the Colorado Plains where archaeological locational modeling was an important goal. I wrote from scratch an entire GIS package that handled digitizing, rasterizing, interpolation, area and distance calculations, application of probability functions, and which incorporated all the special environmental programs I had written in Santa Barbara. This of course involved chasing down primary algorithms in published literature or writing them myself. In any case, I learned a lot.

To complete my story, I accepted my current position at the University of Arizona in 1985. The position allows basic research time which I principally use for field projects and further study of archaeological possibilities with GIS. I've also taught a course on GIS and Archaeology for the last five years which forces me to keep abreast of developments in all areas of GIS.

ARHEO: *It seems that you started working with GIS in archaeology even before the term 'GIS' was widely used.*

K.K.: That is probably true. I got into GIS only because of my need to obtain vast numbers of map measurements for regional modeling work. One chapter of my Ph.D. dissertation in 1983 (published in *Advances in Computer Archaeology* the same year) focused on computer techniques for the derivation of map measurements and their application to archaeological modeling problems. At that time, though, the term 'GIS' wasn't widely known or used, so I naively referred to what I did as something like 'computerized map measurement and modeling'. It wasn't until nearly a year later that I found that what I was really doing was called GIS!

By 1985 I located several other archaeological practitioners of GIS in the U.S. so I co-organized (with Bob Hasenstab) probably the world's first symposium on GIS and archaeology at the annual meeting of the Society for American Archaeology.

ARHEO: *What is your impression of GIS work in archaeology as it is currently being conducted?*

K.K.: It might be too early to pass judgment since much of the discipline is only now learning how to use GIS and the number of archaeologists knowledgeable about it is still low. If we consider GIS as a tool that makes it easier to do what we did before, as many do, then much of what we see is just as good or bad as before, only it is now easier to do good or bad work! But GIS can be much more than a mere tool. Because it is so easy to undertake complex operations or generate vast amounts of information it is possible to combine tasks to attempt things never conceived of before. Generally, only the innovators have the required foresight here, and we have seen some genuinely innovative work. Too many applications seem only to copy what has been done by others, but this may be part of our collective learning process.

Recently we have seen GIS achieve something like a 'bandwagon' status in archaeology with many conferences and symposia around the globe. I think this is indicative of the high level of interest that is out there and it also serves to further promote the technology. With so many meetings we are starting to hear the same stuff over-and-over, however. Predictive modeling continues as a big topic, but what is growing is regional or national database applications, and rightly so. There are still a surprising number of papers that don't even use GIS but merely state what they hope to accomplish when they get their GIS's working! There are also too many applications that tend to focus on the beautiful computer graphics common to GIS, with little or no substance behind the graphics. GIS imagery can be an unfortunate distraction at times! All-in-all, though, I think GIS is improving the quality of regional studies and, more importantly, I think it is getting people more interested in regional work.

ARHEO: *What future trends do you expect to see in GIS technology both in archaeology and out of it?*

K.K.: In archaeology we will certainly get more familiar with GIS and we will see many more and diverse applications. I think the big focus will be on large regional or national data-bases for cultural resource management or planning purposes. GIS is an ideal tool for this. Managers will love pressing a few buttons and getting an instantaneous map of known paleolithic sites, for example.

As for research, who can say where future trends will go? I think there is much unrealized potential in the area of GIS-based simulation. With GIS it would be possible to incorporate the actual physical characteristics of a region into a simulation allowing greater realism, for example.
Recent articles in GIS journals predict that the rate of growth of this industry will be higher in Europe over the next decade than in the United States. I think we will see a similar pattern emerge in archaeology. In the United Kingdom there already are several archaeological programs in GIS, I found GIS interest and expertise among archaeologists very strong in Holland, and now here in Slovenia. In the United States there are no archaeology and GIS programs, just a few isolated class offerings. Despite the reputation of the United States as a place where computer training is advanced, I find that in general archaeology students do not have strong computer backgrounds. This very much contrasts with the situation in Europe where archaeology students with a high level of computer knowledge-archaeological 'hackers'-are not hard to find.
Outside of archaeology we will see more and better software with improved user interfaces. GIS ultimately will become a common component of society, maybe as common as spreadsheets and word processors. The next decade will see a big focus on two issues. The accuracy issue is a major concern already, because if a GIS gives an elevation, gradient or soil type at some location we want to be sure that such output is close to reality! We will also see greater links between GIS and artificial intelligence. AI can help guide or facilitate certain types of analysis or modeling problems and may be helpful at a more fundamental level by directing the system to the most appropriate algorithms when certain contexts arise.

ARHEO: *We appreciate your views as a GIS specialist, but you also have an unusual background in quantitative methods and extensive experience in American Archaeology. Do you think your archaeological perspective is typical of American Archaeology?*

K.K.: No, I don't think so. Like anywhere else we have a basic division between fieldwork and theory, and of course we need good links between the two. The theoretical mainstream is pretty much caught up in a focus that tries to develop explanations and models of past behaviors or even what has been called 'law-like statements'. Much of this still is an outgrowth of the New Archaeology or Processualism that flourished in the 1970's. Although I'm generally sympathetic with these views, I think the way they came about was a unhealthy evolution.
I mean here was Binford and Company who announced *"OK, from now on we will be scientific."* The problem is there was no intervening period that allowed restructuring and retraining of the discipline around scientific research methods. So in too many cases we have had well-intentioned people trying to do research with little or no training in formal methods. This may be one reason why so much of the New Archaeology seems shallow, with few substantive results.
A bigger part of the problem stems from the model the processualists put forward as a standard for archaeological research. Turning to the literature of Philosophy of Science for guidance they selected a physical science, theory-based model. Briefly, a researcher is to formulate an hypothesis or theory concerning the workings of some real-world process based on his or her knowledge, experience or evidence. Then, assuming the hypothesis to be true, implications are to be deduced that can be tested against real world data. Finally, the data are compared against these implications or theoretical predictions; if they agree then the hypothesis is supported, otherwise it is rejected.
Too often archaeologists have employed this as a research model without understanding how it is used by physical scientists. There, the deduced implications are pre-established physical laws that generate concrete, testable predictions, and there are formal validation procedures. David Thomas admits that in archaeology our testable predictions are only 'seat-of-the-pants' generalizations since we have no hard-and-fast behavioral laws, and our testing procedures have been less than exemplary. The assumptions, deduced predictions and testing methods often are so simplistic or questionable that 'results' in this framework typically can fit a wide range of alternative hypotheses.

ARHEO: *Do you see an alternative approach?*

K.K.: Surely. There is another fundamental approach to research that the processualists largely ignored. In experimental work in many sciences research designs are in common use that are formulated to elucidate patterns from bodies of empirical data. These approaches allow data to 'speak' to us; that is, new knowledge is gained by looking at patterns in data. We might collectively label this strategy as a 'data upward' approach in order to contrast it with the 'theory downward' approach that begins with theory and moves down to data. A healthy scientific discipline integrates both of these. There is a group of theorists who make models and predictions about what should occur. Experimentalists then set up research plans to test, verify or refute the theories. At the same time the experimenters working with real data make new discoveries and find new insights that theorists need to explain. A discipline progresses by the healthy interplay and integration of theory downward and data upward strategies.

Archaeological theory in the United States has suffered from a lack of focus on the latter owing in part to an intellectual tyranny of the dominant processualist viewpoint. Exploratory data analysis proposals and research that focuses on statistical patterns in data have not been well received even though it can be argued that our theoretical knowledge is in its infancy and we are still at the stage where we need to merely explore the variation that is out there. Part of the reason for a lack of focus on data-upward research is that few Archaeology Programs emphasize the need for quantitative sophistication. If there is any requirement it is usually only one or two statistics classes, and this is not really enough.

ARHEO: *So you think archaeologists should take more classes dealing with scientific research methods as part of their basic training?*

K.K.: It certainly wouldn't hurt, but generally no. Remember, I've been talking only about the subset of archaeologists who claim to be seriously interested in theory development and behavioral model building. One of my favorite quotes is 'God gave all the easy problems to Physics'. This means, of course, that the task of the physicist is relatively simple compared to the social scientist. The behavioral researcher has to deal with many, many more variables that fit into the human equation than is encountered in any simple physical process. If someone is seriously concerned with developing non-trivial models of human behavior (or laws!) then he or she better get some real training in research methods.

ARHEO: *Thank you for talking with us.*

Za Arheo je spraševal *Zoran Stančič*