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A Message from Dean Richard W. Lariviere  
College of Liberal Arts

I am delighted to share with you this annual report of one of the College of Liberal Arts’ most successful research units, The Institute of Classical Archaeology.

The ICA’s archaeological projects in Italy and Ukraine have been supported since 1974 through the generosity of numerous loyal, individual donors, many of whom are Texans. In recent years private foundations, both within and outside Texas, have been vital to the operation of ICA. The successes that these donors have funded have helped ICA to attract support from the likes of the National Endowment for the Humanities and the National Aeronautics and Space Administration, who have provided significant, long-term support.

Thanks to a series of unusually generous grants from the Packard Humanities Institute in the last three years, ICA has been able to expand its operations, the scope of its projects, and its accomplishments in archaeology at a speed that is unusual even at a major institution like the University of Texas. We are deeply grateful for the generosity of the Packard Humanities Institute, which has transformed ICA from a focused but prestigious unit into a research institute of the first magnitude.

Both of ICA’s major projects in Ukraine and in Italy have won international recognition for the University in the field of Old World archaeology. Every truly great university has centers of excellence with special requirements. Hence, the need for research institutes with interdisciplinary agendas, such as ICA. We are enormously grateful to all the donors who have made possible the wonderful research of Prof. Carter and his colleagues on a number of international, interdisciplinary, collaborative research projects. This good work brings credit to all concerned: to the donors as well as to the scholars and students in the College of Liberal Arts’ Institute of Classical Archaeology.

Congratulations,

Richard W. Lariviere  
Dean
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THE INSTITUTE OF CLASSICAL ARCHAEOLOGY

MISSION
The Institute of Classical Archaeology (ICA) is an Organized Research Unit of the University of Texas at Austin. In order to study, document, and preserve sites, monuments, and artifacts of past life for present and future generations, we conduct archaeological fieldwork and training in ancient Greek rural territories on the Black Sea and the Mediterranean. We engage in interdisciplinary research and publication and provide technical assistance and expertise for cultural heritage management.

RESEARCH FOCUS
ICA’s research focuses primarily on the chorai—or agricultural territories—that surrounded and supported ancient Greek colonial cities. Our two primary sites of research are the chora of Metaponto on the southern coast of Italy and the chora of Chersonesos on the northern coast of the Black Sea in Crimea, Ukraine. Both settings offer remarkably well-preserved ancient rural landscapes, once densely occupied by farmers and still containing abundant evidence of their homes, burial grounds, and places of worship. Because their locations were strategically important, they also contain archaeological remains from the Roman through Byzantine eras. Through its research, ICA contributes to a fuller understanding of the settlement, economy, and culture of this previously neglected rural dimension of early western civilization. Metaponto and Chersonesos provide a unique chance to compare rural chorai at opposite ends of the colonial Greek world, as well as a valuable opportunity to train students, foster exchanges, and generate international collaboration and good will.

ADJUNCT ORGANIZATIONS
The Center for the Study of Ancient Territories (U.S.A.), Pidtrymka Chersonesu (Ukraine), and Il centro di agroarcheologia Pantanello (Italy) are non-profit organizations founded to support the mission and goals of ICA. Their special focus is on expanding international cooperation for ICA’s projects and ensuring cultural awareness and compliance with local laws.
This was a pivotal year for the Institute of Classical Archaeology (ICA), a year of solid achievements on a number of fronts and of new and exciting initiatives in publication, research, university exchanges, and the management of cultural resources. Above all, it was a year of rapid growth and consolidation made possible by a major grant from the Packard Humanities Institute (PHI), whose generous support has greatly strengthened both ICA’s continuing study of the ancient Greek and Roman rural civilizations and ICA’s ongoing efforts to foster mutual cooperation and interdisciplinary research with colleagues in Ukraine, Albania, Turkey, and Italy.

Early in 2001, ICA completed its move from offices scattered over The University of Texas main campus into its new headquarters in the MCC building on the research campus, just a floor below its collaborators in the Center for Space Research (CSR) and across the road from the Bureau of Economic Geology. Remodeling of the new MCC space to meet more fully ICA’s needs was completed over the summer. A newly enlarged conference room forms the heart of the complex and is surrounded by nine offices, work spaces, and archival storage areas. The new MCC space provides a much-improved base of operations for our major projects in Italy and Ukraine.

These ongoing international field projects now also benefit from a US-based nonprofit support institution, the Center for the Study of Ancient Territories (CSAT), and from a pair of new nonprofit centers abroad: the Centro di agroarcheologia (The Center for Agro-archaeology) at Pantanello in Metaponto, Italy, and Pidtrymka Chersonesu (Support for Chersonesos) at Chersonesos in Sevastopol, Ukraine. Both foreign-based centers—locally administered—became fully operational and were officially recognized in their respective countries in 2001 and will provide much needed year-round supervision of the growing number of projects and personnel there, as well as help to ensure ICA’s compliance with local laws and fiscal practices.

ICA was also notably strengthened this year by the addition of several new staff members and by the delegation of new responsibilities to others. Carol Cook, our new administrator, comes to us with much experience and success in managing a nonprofit international foundation. Her involvement has freed Asele Surina to concentrate on ICA financial development and the coordination of our efforts in Ukraine. Taissa Bushnell brings much to her new position as ICA’s representative to The National Preserve of Tauric Chersonesos (NPTC, or “the
Preserve") and as the director of Pidtrymka Chersonesu: a Masters of Arts in Medieval Slavic history, a broad understanding of Ukrainian culture, and a firm command of Czech, Russian, and Ukrainian. She has surpassed our expectations in dealing with a large variety of sensitive duties. Rosetta Torraco, our longtime assistant in Meta-ponto, is doing a commendable job in coordinating ICA’s ongoing work in the new Centro there. At the same time, both women are assisting with our publication efforts. Roman Sazonov, a citizen of Russia and a graduate of Williams College who worked on the Chersonesos site in summer 2001, has joined our publication team in Austin to assist in the extensive research necessary for creating an English-language guide to Chersonesos and to contribute his considerable translation skills.

Asele Surina’s success in development is already proving to be impressive. She and I worked together last January on the nomination of Chersonesos to be listed as one of the 100 Most Endangered Sites of the World Monuments Watch. The nomination was successful again for the third biennium, a distinction of note. She and Taissa worked together over the summer, along with an accountant, a lawyer, and a banker, to make Pidrymka Chersonesu a reality in Sevastopol. Asele was also the driving force in a major grant application on behalf of Chersonesos to the Japanese government. She recently completed an international, interdisciplinary grant proposal to the Getty Foundation for further scientific research on the stele of Chersonesos. Currently, she is working on the UNESCO nomination of Chersonesos, which was benefited this fall by a visit from Henry Cleere of ICOMOS (The International Council on Monuments and Sites) who kindly shared his wisdom with us on how to approach this challenge. Chersonesos is now on the tentative list of Heritage Sites, which is amazing progress for a site that was a top-secret military base less than a decade ago.

With Asele in charge of this vital aspect of our work, I can concentrate on publishing past research, a task that has long awaited more of my attention. Also, I can now worry less about the many bureaucratic requirements with which ICA must deal because of the capable administrative and organizational skills that Carol Cook and our office manager, Pat Irwin, are contributing.

ICA, established in 1978 as an autonomous Organized Research Unit at The University of Texas at Austin, has become widely recognized for its interdisciplinary study of the ancient territories of the Greek and Roman periods. From this work, a number of MA theses and Ph.D. dissertations have resulted, both at The University of Texas and at other universities around the world, in Geography, Anthropology, Art History,

Figure 1.2. ICA’s Taissa Bushnell in the Chersonesos Preserve Museum courtyard with the former Prime Minister of Ukraine, Viktor Yushchenko, on holiday visit to Chersonesos, and Leonid Marchenko, the Director of the National Preserve, July 2001.
and Architecture, as well as Classical Archaeology. The broad interdisciplinary approach that ICA has developed over the years has received international recognition. Its major research sites, the chorai of Metaponto in southern Italy and at Chersonesos on the Black Sea coast of Crimea, have become basic points of reference for all who wish to understand the ancient rural life and economy of the Greco-Roman world.

Publication
A principal focus of ICA’s activity in recent years, supported by earlier grants from PHI—and by longtime donors, such as the Brown Foundation, the James R. Dougherty Jr. Foundation, the Marian and Speros Martel Foundation, and the Trust for Mutual Understanding—continues to be the study and publication of the results of pioneering fieldwork on the ancient territories. Much of our combined efforts during 2001 has been directed towards this end, and significant progress has been made. Three projects among ICA’s publication commitments were given priority in 2001:

- The second volume of the Chora of Metaponto series, entitled Archaeological Survey (1981–1990) and Related Landscape Studies, is among our top publication priorities. ICA is coordinating a thorough study of the over 40,000 fragments of pottery, terra-cotta figurines, and loomweights collected from some 550 sites surveyed between 1981 and 1990 between the Bradano and Basento rivers. A second volume on the survey will deal with the area between the Basento and Cavone rivers, which is currently being investigated. (See Fieldwork 2001, and also Metaponto Archaeological Survey, below). Because the survey artifacts are stored in Metaponto, the ICA laboratory team consists mainly of Italians, including experts on Greek (Dr. Enzo Cracolici) and Roman and Medieval (Dr. Erminia Lapadula) pottery, as well as two illustrators (Drs. Cesare Raho and Eloisa Vittoria) and a photographer (Dr. Giambattista Sassi). Much of the work of the Italian team is now complete, and ICA is making good headway in the next level of analysis and write-up. Final editing and layout of completed portions have already begun.

- A team led by Glenn Mack is working closely with the staff of the National Preserve of Tauric Chersonesos (NPTC) to produce the first English-language history of the ancient city, chora, Museum, and environs of Chersonesos. At this point, most of the contributions in Russian have been received and are being translated and edited by the team. Glenn’s work this summer in the Preserve archives and this fall in Austin, along with Chris Williams’ photography on site and in the Museum, will add greatly to the book’s visual interest and appeal. Other ICA staff members (Jessica Trelogan and consultant Jodi Lane) are contributing to the design and preparation of a series of maps and plans that will be part of this work. Glenn is also doing the layout for the book, with assistance from Chris.

- “The Discovery of the Ancient Countryside at Metaponto” was the title of the Thomas Spencer Jerome Lectures that I gave in early November, 2000 at the University of Michigan and in late May, 2001 at the American Academy in Rome. I began working on the expanded book version of these lectures early in 2001, and the manuscript is nearly complete. Previously, writing while dealing with a busy schedule of teaching, lecturing, and directing field projects was grueling. Now, thanks to the PHI grant, I have the time away from these tasks for the concentration that serious research and writing requires. The Necropoleis volumes took a dozen years to research and write. “Discovery,” which is a much more wide-ranging work covering all aspects of our more than twenty-five years of research on the chorai, and which includes a dense bibliography on much-debated problems like ancient houses, extra-urban sanctuaries, and Orphism, will have taken less than two years. Contemporaneous with the writing, Chris Williams has been preparing the book’s illustrations, and designing graphs, tables, plans, and charts in a uniform format.

Ongoing Projects
Dr. Mariah Wade and her team, including a number of University of Texas students, have nearly completed their analysis of the massive amounts of ceramic material (roughly 300,000 fragments) from the Pantanello sanctuary. Mariah’s book-length study of the pottery of Pantanello, which will be one of the sanctuaries volumes in The Chora of Metaponto series, is scheduled to appear in 2003. Her chronology and typology of the material will be a basic reference work in the field and indispensable for all working in Metaponto and southern Italy. The extensive thin-section and neutron-activation analyses will fill a major void in our knowledge of the ceramics of the Western Greek world.

Collaborators Mary Malone, Marsha Robbins, and Smadar Gabrieli (see reports in this volume), working on the terra cotta figurines, amphorae, and cooking ware from Metaponto, have made punctual contributions. The
important and much-awaited paleobotanical research by Lorenzo Costantini on the seed remains from Pantanello and Incoronata is also nearing completion, and, it is hoped, will be ready in time to be included in the new sanctuaries volume. Besides coordinating the work, my contribution will be, principally, the discussions of the excavations that I began in 1974 and the historical development of the sanctuary at Pantanello from ca. 600 BC until its conversion to a Roman villa and ceramic factory in the 2nd century BC. The factory and its deposits will be the subject of yet another volume of The Chora of Metaponto series. This Roman period complex was in use until the 2nd century AD, producing, besides tiles, an unparalleled series of molded “greyware” vessels. This volume will also include a major study of archaeozoology by the late Professor Sandor Bőkönyi of the Hungarian Academy of Sciences.

The research on the unique polychrome grave monuments of early Hellenistic Chersonesos (late 4th and early 3rd centuries BC) made a quantum leap in quality and technical sophistication this year with the participation of art historian Dr. Richard Posamentir and conservation chemist John Twilley (both for a second year). Posamentir added significantly to the body of material, both for conservation and study, by his many discoveries. His most important contribution was his recognition of the lower portions of stelai in an outdoor deposit of the Preserve. This increased the number of complete stelai by a factor of three. Posamentir is also a specialist in the use of ultraviolet techniques for recovering elements of the design that are not apparent in the visible wavelengths (see page 48, top). Twilley added infrared study of the stelai to the project this summer and sampled additional monuments for his study of the components of ancient pigments. Dr. Paula Perlman, working in England, carried forward the epigraphical study of the approximately seventy inscribed stelai that exist among the grave monuments. This broad collaboration is both international and interdisciplinary. (Its importance was recognized by the German archaeological authorities, who gave Posamentir a prestigious three-year grant to complete his part of the study.)

With the goal of establishing an in-house publication series, ICA acquired the remaining copies (51 from a run of 600) of the first of the Metaponto series, The Chora of Metaponto: the Necropoleis, as well as the publication rights from UT Press and the printer’s digital files for any future reprinting of these well-received volumes.

Fieldwork 2001

Chersonesos: excavation in the city
During the summer of 2001, ICA carried out its first excavation inside the walls of the ancient city. This was done in collaboration with a University of Lecce team under the direction of Prof. Paul Arthur and with the Preserve’s Vice Director for Conservation, Larissa Sedikova. The site was a city block along the main street of Byzantine Chersonesos, across from the cistern that served as the city’s central water supply until it was abandoned in the 9th century AD. The work force was, for the first time, composed mainly of students of archaeology working on advanced degrees at the Kyiv Mohyla Academy University, the University of Lecce (Italy), Taras Shevchenko State University (Kyiv), and The University of Texas at Austin, as well as universities in Sweden and the Czech Republic. This proved to be an enormously stimulating experience for all involved.

Figure 1.3. Richard Posamentir prepares to take an ultraviolet photograph of a stele in the Chersonesos Museum, summer 2001. [cw]
The excavation, which will be described in detail in this volume by Prof. Arthur, Dr. Sedikova, and Jessica Trelogan (who helped to record it with an innovative site-based GIS), produced important evidence for the latest era in the history of Chersonesos, the 13th and 14th centuries AD. A small chapel of a type widely distributed throughout the city and a large building of as yet undetermined function were uncovered along the street. Among the finds were much Byzantine pottery—some rare and of unusually high quality—and an iron bishop’s cross, the largest yet found at Chersonesos.

The collaboration and educational results of the campaign will ultimately prove, I believe, to be of lasting value and importance. Special seminars were held for the students and Preserve staff on the interdisciplinary aspects of the research at Chersonesos: on paleogeography and palynology by Paul Lehman and Carlos Cordova and on remote-sensing and GIS by Jessica Trelogan, who also gave after-hour tutorials in the use of the total station to a group of enthusiastic Ukrainian and Italian graduate students. Paul Lehman also presented a well-received hands-on archaeological soils tutorial to Paul Arthur’s crew of young Italian archaeologists.

Alex Bauer, a Ph.D. candidate in archaeology at the University of Pennsylvania and a member of the Sinop Project on Black Sea trade, found evidence of possible contacts between the north and south coasts of the Black Sea in prehistoric times. This period has not received the attention that it should by archaeologists working in the Greek chora. Alex shared his results with project members and hopes were expressed that these discoveries might lead to a collaborative effort, with Oleg Savelya of the Preserve staff and other interested parties, focusing on the prehistory of the Heraklean Peninsula.

During early July we were honored by a visit from Neal Ascherson, Professor of Public Archaeology at the Institute of Archaeology, University of London. He offered his expert advice to our planners who are working with their Ukrainian counterparts to develop the ancient city and chora as an archaeological preserve that will most effectively serve the needs of the local population and the international visitors who will be drawn to Chersonesos. Professor Ascherson delivered a public lecture in the Italian Garden of the Museum to an audience of excavation students and staff, the entire staff of the Preserve, and the general public. He stressed that an institution such as the National Preserve must serve multiple roles as a center of research and teaching if it is to survive and prosper; its mission and activities should be aimed not only towards scholars or school children, but also should actively involve the public at large.

Asele Surina’s extraordinary abilities as a simultaneous interpreter played a big role in the success of the seminars. We had been told by Svetlana Telenkova, who helped to organize the Ukrainian student participation in the field season, that the students had been reluctant to leave Kyiv for Sevastopol. Now, they and their classmates are lining up to participate in the 2002 campaign, when we also hope to have participation by students of archaeology from the University of Simferopol (capital of Crimea). The international on-site school that the Preserve and ICA have long hoped to establish is at last becoming a reality.

Chersonesos: conservation and excavation in the chora

The conservation of the Hellenistic Greek farmhouse (Site 151), the first excavation of the joint teams (1994–1996), was completed in 2001 under the direction of conservator Vera Nikolaenko. (Her report follows.) This work has been generously supported in the past by the Samuel Kress Foundation. Earlier work (1996–1998) did not prove entirely satisfactory, but now, after several years of trial and error, formulas and techniques have been developed that are better adapted to the relatively harsh, wet winters of Crimea. These results are not only durable but also aesthetically pleasing. Site 151 is in the center of the area that will be the heart of the proposed archaeological tourist itinerary of the chora. (See below, Master Plans).

Nearby Site 132 was chosen this spring for the next conservation effort. It is considerably larger and more complex than Site 151 and, as soon became evident, had been very incompletely excavated. What began as site-cleaning prior to conservation, became in June a full-blown excavation that continued until October, under the direction of our colleague at the Preserve, archeologist and Deputy Director Dr. Galina Nikolaenko. A number of unusual features came to light as excavation progressed. Dr. Nikolaenko has contributed a preliminary report for this publication. (See below.) Conservation, which progressed throughout the summer and fall in areas where the excavation was complete, will continue in 2002. Site 132, like Site 151, is located within the largest area of undisturbed ancient
countryside on the Heraklean Peninsula and lies adjacent to the entrance and visitors’ center planned for this area in a tourist itinerary. (See Master Plan below.)

Additional sites in this locale still await excavation and conservation. This past season, a campaign of remote sensing by Mikhail Nikolaenko and his team, using electrical resistivity, revealed indications of several unexcavated or partially excavated farmhouses in this area, including the nearby Site 133 (see report, p. 39).

**Chersonesos: paleogeography**

Paul Lehman of ICA and Prof. Carlos Cordova of Oklahoma State University had their longest and most intense campaign to date as they explored the larger context of geomorphological and botanical change in southwest Crimea. Of particular interest among their results is Carlos’s discovery of two periods of vegetation migration from the southern Black Sea and Mediterranean to Chersonesos in the northern Black Sea area: one in the Neolithic and one during the period of Greek colonization. (See their report below.) The cumulative efforts of five campaigns by Lehman and Cordova are producing a coherent picture that is reaching a wider scientific audience through their already numerous publications. A positive aspect of this research is the close working relationship that these two have built with Ukrainian researchers in the Academy of Sciences and at the University of Simferopol. Their results will be an important part of the NASA-sponsored GIS for the chora that Jessica Trelogan is developing. (See her report, below.) A monograph by Paul for a planned Chersonesos publication series is well under way. This English-language series with summaries in Ukrainian and English, which is to be called *Chersonesos Studies*, will also ultimately be available on-line and will complement the current Russian language *Khersonesky Svorink*.

**Chersonesos: computerization**

When ICA began to excavate at Site 151 in 1994, it provided the Preserve with its first two computers. Given the talent and desire of the Preserve staff, computerization moved rapidly, but really took off when Glenn Mack joined the ICA staff. (See his contributions to this Annual Report.) His initial job was to create websites for ICA and the Preserve, so that for the first time, the Preserve staff would have easy communication with the outside world, a way of letting the world know what Chersonesos is and what it is doing and to stimulate contacts and collaborative work. This is all the more important given the very few opportunities Ukrainians have to travel and the difficulties foreign visitors presently have in reaching Chersonesos. Under the energetic supervision of Lucy Grinenko, the Museum website, chersonesos.org, has developed enormously over the last year. Its Russian language version is rapidly filling out; the English one will appear in 2002. The website is also being translated into Ukrainian under the direction of Svetlana Telenkova. The Ministry of Culture was pleased with the results and wants to make the Chersonesos web site a model for future museum sites in Ukraine. Glenn has also installed video conferencing capabilities between ICA and the Preserve, allowing for better, ongoing interaction between the two organizations.

The most urgent work for Glenn and his collaborators at the Preserve, however, is scanning the irreplaceable collections in the Museum’s Archives, which contain hundreds of excavation reports (dating to the 19th century) as well as thousands of historical photographs, maps, and plans, most of which exist only as a single copy. A great deal of scanning went on under Glenn’s supervision during the summer of 2001, and the Preserve staff is being trained to use the equipment in special classes arranged by Glenn and Taissa Bushnell. It will soon be a self-sustaining project. Major goals for the future are computerized catalogues of the Library—which Lucy Grinenko is preparing—and development of a unified database for the Museum’s collections.

**Chersonesos: management of cultural resources and master plans for the Preserve**

During the spring of 2001 Carl Holiday and Alma Maldonado Holiday, working with their Ukrainian colleagues and the archaeologists of the Preserve staff, completed a “Master Plan for the Ancient City.” A preliminary version was presented in Fall 2000 to the Vice Primer of Ukraine, the Minister of Culture, and the Mayor of Sevastopol. A fuller version (in English and Ukrainian) outlines a long-term step-by-step proposal for harmonizing the scientific, religious, and touristic aspects of the site, with the goal of enhancing and preserving its historical and artistic monuments. Individual projects will be implemented by a joint Ukrainian–US architectural team.

In summer of 2001, Carl and Alma brought a team of four architects and landscape architects to Chersonesos to assist them in two large projects:
• The most urgent need of the Preserve and of the Preserve’s collaborators (like ICA) who are engaged in field research is a building for the storage and study of artifacts. Since it was not deemed advisable at this point to erect a new building within the city’s walls due to the high density of ancient structures below the surface Carl chose to concentrate on an historic monastery building in urgent need of major repairs, including a new roof and foundations. His design incorporates laboratory and storage on three levels and increases the Preserve’s current storage space by 5,000 square feet. Consultants Kolya Andrushenko and Tatiana Bersanova are ensuring the plan conforms to Ukrainian specifications. The next stages of the project, obtaining competitive bids on construction (a new concept in post-Soviet Ukraine) and steering the plans through various stages of official approval, have begun. These delicate matters have been confidently entrusted to Taissa Bushnell.

• The “Master Plan for the Chora” was begun during July 2001 by Alma and her group, working closely with the Preserve staff, especially Dr. Nikolaenko, and the city planners of Sevastopol. The text, photographs, and drawings of this companion volume to the “Master Plan for the Ancient City” are currently underway. Alma’s sensitivity to the significant history, current economic position, and pride of Sevastopol is apparent throughout the plan. Both architecture teams benefitted greatly from the dedication, linguistic and negotiating skills, and endurance of a translation team consisting of Svetlana Telenkova and Galina Mamenko.

A short version of the Master Plan for the Ancient City, translated into Ukrainian by Taissa Bushnell, was presented to the President of Ukraine on his state visit to Chersonesos with the President of Russia in July. By summer 2002, we hope both the city and chora master plans will have full-length Ukrainian editions.

The Metaponto survey
During an eight-week period from mid-June to mid-August, Dr. Steve Thompson, with the assistance of Albert Prieto, directed a survey campaign in the chora of Metaponto. His team consisted of eight students from the University of Texas, the University of Cincinnati, and Florida State University. The objectives were to continue the resurvey, begun last year, of selected portions of the Bradano-Basento transect and to extend the coverage of the Basento-Cavone transect. Both projects relate directly to the survey publication currently underway and
that projected for the near future. Resurvey not only has resolved a number of questions important to the current publication effort, but also has revealed important new information about the long-term effects of agricultural practices on the survival of the typically small, rural sites that are the focus of much of our work at Metaponto. Among the new areas surveyed between the Basento and Cavone Rivers in 2001 is a large area (ca. 2 km²) of contiguous fields in the San Basilio vicinity, adjacent to the Cavone River, along the southern margins of the Metapontine chora. The total number of archaeological sites documented by ICA survey between the Bradano and Cavone Rivers now stands at 829. At least three-quarters of the sites were occupied during the period of the Greek colony at Metaponto. There can be no doubt that the chora was densely inhabited in antiquity. The remarkable preservation of the ancient agricultural landscape at Metaponto, especially as it compares with other areas of the Mediterranean, and the long and multifaceted record of ICA research there gives this ongoing work a significance that extends well beyond the bounds of our study area.

Over the spring, summer, and fall of 2001, the pottery team of Italian experts has been busy. Cracolici and Lapadula worked under the supervision of Paul Arthur (another example of how our international teams collaborate). In July, Cracolici spent a week with the survey team to complete his first reading of the massive quantity of Greek material collected by the survey and to discuss issues relating to its further analysis and publication. Lapadula, who was with Paul Arthur in Chersonesos this summer, returned to Metaponto in the fall to complete her study of the Roman and Medieval pottery from the survey and has sent her results to us. Cesare Raho and Eloisa Vittoria, our drafters in Italy, completed the drawing of over 400 pieces of black gloss pottery chosen by Dr. Mariah Wade to illustrate this pottery from the Pantaello Sanctuary. They are currently finishing illustrations of the material from the survey, which is now nearly completed.

I want to thank the entire ICA staff for a superb team effort in 2001. None of this, of course, would have been possible without the support of Dr. David W. Packard and the Packard Humanities Institute, to whom we are immensely grateful. Together we have made a great start to the new century.

Figure 1.5. At a weekly ICA staff meeting, Alma Maldonado presents her design for the Archaeological Park in Chersonesos. [CW]
CHERSONESOS

EXCAVATION IN THE ANCIENT CITY

Paul Arthur and Larissa Sedikova

In 1997 Mats Roslund published a number of Byzantine objects from Lund and Sigtuna in central Sweden, dating from the 11th to 13th centuries. The artifacts had traveled across the Black Sea, up the Dniepr River, through northern Russia, perhaps down the river Lovat, and across the Baltic, for some 2000 kilometers. There is little doubt that, like the famous Helgo Buddha, by the time they reached Scandinavia they were to be considered items of substantial prestige. Whatever the nature of the trade mechanisms that permitted their arrival so far to the north, they reflect a lucrative two-way movement of goods. This exchange was based on a series of strategic entrepôts that included both Novgorod and Kyiv and helped lay the foundations of the latter’s development into one of the earliest and major cities of Russia. Before leaving the Byzantine Empire, the goods passed through outposts on the northern Black Sea coast, one of the most famous of which was Chersonesos, located in southwestern Crimea. Why was this so?

With the collapse of the Roman provinces of Western Europe during the course of the 5th century AD the center of gravity shifted from Rome to Constantinople. The eastern Mediterranean and the Black Sea, which

Figure 2.1. Location the 2001 excavation site in the National Preserve of Tauric Chersonesos. [J. LANE]
under the early empire had seemed almost marginal to the capital, now became of outstanding importance to the survival of Byzantium. New markets and new centers of supply had to be found if Constantinople was to survive the onslaught of migrating peoples attracted from the northern fringes of the ancient world to the shores of the Mediterranean Sea. As the West and North Africa were lost to the empire, increasing resources were thrown into securing Asia Minor, the Aegean islands and the Pontus Euxinus or Black Sea. This large inland sea, linked directly to Constantinople and the Aegean through the Bosphorus and the Dardanelles, not only offered splendid wealth and resources from its hinterlands, but also provided links with the Middle and Far East and with the northern steppes and the Baltic.

Under the emperor Justinian, during the mid 6th century, key areas of the Black Sea were heavily re-fortified. Abundant archaeological evidence comes from the western coast where, for instance, the port-city of Costança in present-day Rumania became a prime supply-base for the new defenses along the Danube. Indeed, in Bulgaria, Justinian founded his own city of Justiniana Prima at modern Carcin Grad. Much less is known to western audiences about the northern fringes of the Black Sea, where Byzantine interests were in direct conflict with the steppe peoples such as the Goths. In Crimea, Justinian reorganized the klimata or regions, constructing fortresses and defensive walls in the highlands backing the coast. Magnificent defenses and churches can still be seen in an admirable state of preservation at sites such as Mangup Kale, Chufut Kale and Eskikerman. The design of these defenses was not so much to avoid coastal settlement of the inland tribes, but to protect the Byzantine trading cities or emporia along the coast that also acted as “early warning systems” to inform Byzantium of the changing political situations among the steppe peoples. Pride of place was retained by the Greek foundation of Chersonesos that, in late antiquity and early Byzantine times, witnessed an impressive moment of consolidation and reconstruction. This is best seen in the building of a number of large basilical churches, at times over 50 meters in length and adorned with imported marble columns and capitals.

The resources that poured into Chersonesos from Byzantium helped consolidate its future as a strategic site and emporium. It was thus able to survive the political and economic troubles of the early Middle Ages, which brought about the decline of many other cities throughout the empire and beyond. Indeed, it continued to develop substantially during later medieval times. The chronology and nature of the demise of Chersonesos is still far from resolved. Whether it should be attributed to the Tartars, the Turks, Genovese commercial competition with a failing Byzantium, or a combination of factors, future research should provide an answer.

With this basic historical premise in mind, a team from the University of Lecce joined forces with the Institute of Classical Archaeology of the University of Texas (ICA), the ICA-sponsored teams from Kyiv Mohyla and Taras Shevchenko universities in Kyiv, the National Preserve of Tauric Chersoneses and its collaborators from Kharkiv, Ukraine, as well as additional students from universities in the United States, Sweden and the Czech Republic, to excavate a site within the city walls of ancient Chersonesos. The excavation was directed jointly by Dr. Paul Arthur, Professor of Medieval Archaeology at the University of Lecce, and Dr. Larissa Sedikova, Vice Director for Conservation at Chersonesos, and was supported—scientifically, logistically, and financially—by ICA, whose numerous research projects in Chersonesos, under the direction of Joseph Carter, have been running since 1994.

The site, excavated in June and July 2001, comprises an insula of the town, on a high point of the settlement, just within the Roman city walls (figures. 2.1 through 2.3). To set the site in context, the first few days were spent cleaning old excavations. These were located to either side of the main public water reservoir or castellum aquae and had been conducted by the Russian archaeologists K. Kostysushko-Valuyzhinich at the turn of the 19th century and N. Pyatysheva from 1958 to 1974. This enabled us to examine the imposing walls and a tower, which had been discovered fortuitously in 1855 by Colonel Bertie-Delegard during Russian military works. Furthermore we were able to attempt a certain measure of reinterpretation of the earlier discoveries.

The first construction documented in the area seems to have been a tract of the Hellenistic city walls, built of large ashlar masonry. The Roman city walls, instead, appear to have been constructed around the 3rd century AD, presumably as a protection against the Sarmatians, and deviate slightly from the line of the earlier defenses (figures 2.4 & 2.6). The reservoir, which had been excavated during the 1990s by Larissa Sedikova, appears to have been built slightly earlier over the Hellenistic walls, as its southern side had been incorporated within the Roman defensive wall.

The important group of finds from the cistern fill suggests that it had probably been abandoned during the 9th century (Sedikova 1995). Whether this was because the aqueduct was cut during unsettled times, with Khazar difficulties and the growth of the Kievan Rus who had even attacked Constantinople in 860, is still too early to venture. Be that as it may, the abandonment of the reservoir and its successive use as a rubbish dump probably signaled the end of piped water to the city. Preliminary data suggests that wells and cisterns became more common in the town from the 9th–10th centuries, perhaps to make up for the lost water supply, and two have been recognized in
Figure 2.2. Plan of the principal excavation area in the southern sector of Chersonesos. The 2001 campaign centered on the major plateia ("main street") and the structures to the north of it.
the area. Though we were not able to excavate them to their total depth for reasons of safety, the excavation of the lower levels has enormous potential for recovering rare well-preserved organic remains.

Three contiguous rooms were built against the northern wall of the cistern. They fronted an impressive main street, over 5 meters wide, which was brought to light during the 2001 excavation season.

The Street
Most of the recent excavation concentrated on the main street and adjoining city block or insula. The street, which crossed Chersonesos from east to west, was probably first laid out by the Greeks. After excavation of an extensive rubble deposit—formed by the collapse of adjoining buildings—the latest cobbled surface was revealed, possibly dating to the 13th century. A 20th century pit, cut into the street, showed that the latest surface lay above earlier surfaces, to a total of about 30 cm down to bedrock. The rubble that overlay the street was fairly homogenous, though it contained a fragmentary Byzantine tombstone (Plate I), which was perhaps reused in the buildings. Two small alleys led from the street, one to the church and a yard to the north, and the other to the south, leading to a building west of the reservoir.

Figure 2.3. Detail plan of the 2001 excavation site.
A stone block was discovered used as a bench in the road, placed just in front of the main building complex described below, while two stone uprights of uncertain function were found embedded in the street surface in front of the church. A number of human bones were also found scattered in the street by the church, suggesting some sort of over-spill. This is difficult to interpret, but may represent the creation of charnel-pits, once the space within the church was filled. The final street surface, just prior to abandonment, was strewn with animal bones, probably mainly sheep. We do not yet know why, though perhaps animals grazing in the town during its final years were butchered nearby. Through future excavation we hope to be able to chart the life of the street and its abundant reconstruction and patching.

To the north, the street was fronted by a major building complex and a yard in which a church had been built.

The Complex
This is a major complex, probably a house, of which five rooms have been examined, though only two totally unearthed (figures 2.3 & 2.7). The remainder lies partly outside the excavated area. We cannot yet date the construction phases of this building, though it may have been in existence as early as the 10th or 11th centuries.

The walls of the largest excavated room (room 26) were found to contain horizontal wooden beams inset on both internal and external faces (figure 2.8), which the paleobotanist Girolamo Fiorentino has identified as deciduous oak with ancient woodworm attack. Room 26 is the only one of the complex that presents this particular construction technique, though it has been identified in other parts of Chersonesos. Furthermore, the walls of the other rooms abut its walls. This demonstrates that room 26 was the first to be built and was, perhaps originally, a freestanding building.

Without excavation of the entire complex it is difficult to understand to what use the various rooms were put. Though there is an entrance to room 26 from the street, perhaps the adjoining room 20 was originally the main entrance to the building. It also appears to have opened to the street and was longer than room 26. Furthermore, only the rear of room 20 appears to have had a tile roof, while the rest was almost certainly open to the sky, perhaps as a small internal courtyard. Indeed, it was the only room to have yielded decorated stonework, including part of a limestone window frame with interlace ornament picked-out in red, dating to around the turn of the millennium. To the north it opened onto room 22, which, in turn, opened onto room 23. Room 22 had no tile col-

Figure 2.4. Aerial view of the site. [J. TRELOGAN]
lapse and may also have been open to the sky. Room 23, instead, was clearly roofed and had an opening onto a small corridor, room 27. The latter led back to room 26, as well as to the small room 27, both of which were probably roofed.

Room 26 yielded a large pithos upon a stone base in its northwestern corner. Room 21, in particular, contained many smashed amphorae and storage jars or pithoi, of a type dated by Yakobson up to the 13th century, sealed beneath the collapsed tile roof. This suggests that it was a storeroom. Beneath the smashed pottery was found one of the most spectacular finds of the season, a Byzantine iron signon (processional cross), which was carried by the clergy in processions during feasts such as Palm Sunday (see Plate I). The cross will be examined by x-ray, as such objects often bear dedicatory inscriptions. Its presence in the building suggests that it may have been a priest’s house. A certain amount of wealth is also indicated by exquisitely decorated pottery, including both the noted Byzantine Zeuxippus ware and a turquoise-glazed bowl with impressed decoration and a pie-crust rim from Syria or Egypt (plate II). Preliminary analysis of the finds suggests that the entire complex was destroyed in the second half of the 13th century.

The Yard

The complex was bordered to its immediate east by a yard. This space was separated from the road by a small church and appears to have been closed to its east by another building, associated with a cellar. The beaten earth surface of the yard presented extensive patches of burnt material, charcoal, and ash. Within the yard was a cistern, constructed of squared stone blocks set in circular rings to form a beehive-shaped cavity. Its fill, which has not yet been completely excavated, has yielded sherds of Glazed White Ware II, a small jug with curious motifs incised prior to firing, and other finds that suggest it was back-filled during the 10th century (figure 2.9).

The Church

Perhaps dating to around the 11th–12th century, the church was a very small building, with a limestone reliquary box for holy items set within the raised apsidal area and little in the way of decoration, presenting plain whitewashed interior walls (figure 2.9). Two stone-lined tombs were found in the nave, though they appear to have been used as charnel pits, presumably after having served for single inhumation burials. The bones have been left in place for meticulous excavation next season, when we hope to be able to understand the way in which burial took place and try to reconstruct anthropological aspects of the population.

It is likely that the church served the population of the quarter. Chersonesos had such a quantity of small, late Byzantine churches that it would seem that virtually each insula or quarter possessed its own. If these churches effectively belonged to each insula, we may suspect that they were built from funds provided by all its inhabitants or by one particularly devout and wealthy family. We may take this line of thought a step further and suggest that each church served a localized management of each insula. Furthermore, perhaps the inhabitants were directly concerned with the communal management of their own services, such as water supply, street cleaning, policing, and so forth, possibly under the charge of the priest or of an influential family. A similar system seems to have existed in medieval and modern Naples, which was another provincial Byzantine city with a wealth of small churches. Perhaps the yard bordering the church was also communal.

Figure 2.5. Co-Field Directors Dr. Larissa Sedikova and Professor Paul Arthur at the site, June 2001. [K. Waring]
Figure 2.6. City wall and tower (left) with reservoir, background.

Figure 2.7. Three rooms of the building complex looking towards the street and the reservoir.

Figure 2.8. Walls of room 26 with lacunae from decomposed wooden beams.
The Cellar
In another part of the yard was a cellar (room 25) with a paved stone floor (figure 2.11). The upper part of the cellar had probably been demolished, thus providing the rubble and tile fill that sealed a number of smashed but well-preserved objects. These included various pottery vessels (figure 2.12), including a rare Byzantine decorated ceramic cooking stand (plate I). Numerous small fish bones and scales show that fish, among other items, was stored here. The cellar forms part of a building that extends outside of the area excavated. Of this building the western wall seems to be located at the edge of the excavated area, which opened onto the yard and which possessed a staircase that presumably led to a second store.

Later Occupation
It is too early to decide whether or not the excavated complex, as other parts of the city, was destroyed during a Tatar sacking in the latter half of the 13th century. Certainly various contexts dating to the 13th century with traces of burning appear to be sealed by rubble, which effectively signals the end of organized occupation of the excavated part of the insula. The rubble contained principally 13th century ceramics (figures 2.13 & 2.14). Hardly any stone-robbing appears to have taken place, though the church was quite clearly visited and sacked for stone.

Small segments of later stone walls have been found built upon the destruction debris in the yard, while some later pottery has also been found above or within the rubble suggesting the dumping of domestic rubbish from somewhere close by. The pottery (figure 2.14) includes two rather well-preserved vessels, a bowl and a one or two-handled jar, both with similar interior yellow lead glazes, as well as a flagon decorated with finger indentations and gouged lines through a white under-glaze slip. This last vessel may be a 14th–15th century import from Bulgaria. (We thank Natalia Ginkut for this suggestion. She has

Figure 2.10. The small church. [PA]

Figure 2.11. 10th century pottery from the courtyard cistern and other contexts: small jug with incisions—realized prior to firing—below the handle (PA 112 [153]), height: 8.5 cm.
identified similar pottery from the excavations at the Genovese castle of Cembalo, Balaclava.) However, the latest coin from the excavation, found within the rubble layer, was a bronze trachy from the Latin Empire of Constantinople (1204–1261).

Even these relatively slight traces demonstrate later activity in the southern part of Chersonesos, which must now be added to the evidence presented by Romanchuk for her 1986 excavations in the harbor area overlooking Quarantine Bay.

**Conclusions**

Little has yet been identified predating the 13th century, and clarification of earlier phases will have to await further excavation. However, it is clear that even in this area urban development was strongly conditioned by the original street plan and by the Roman imperial layout of the area.

Though it would seem that there was a significant phase of activity dating to around the 10th century, undoubtedly the majority of finds date to the 12th and 13th centuries. Whether the church and building complex are of this date, or slightly earlier, will have to be seen. Nonetheless, it is remarkable that a large quantity of the finds, including imported ceramics, belongs to the period of the Latin domination of Constantinople. Afterwards, the archaeological evidence thins considerably and the excavated area appears to have served mainly as a dump for waste, though fragments of 14th and, perhaps, 15th century pottery have been found in the uppermost layers.

Thus, it may be that occupation at Chersonesos continued down to, at least, the arrival of the Ottoman Turks in the area at the end of the 15th century, even if the city was not as densely inhabited as it had been in the 12th and 13th centuries. This suggests that it may have continued to play at least a minor role as intermediary between Byzantium and the northern peoples right down to the capture of the capital by the Turks in 1453. However, Byzantine coin circulation, according to Alekseenko, appears to have dwindled in the period following the end of the Latin Empire of Constantinople in 1261. This was the time in which Genoa increasingly took over international trade in the Aegean and the Black Sea. Genoa’s base was in Constantinople itself, in the Galata region, but colonies were also established around the shores of the Black Sea, including the Crimea, at Sudak, Caffa, Cembalo and Kalamita (Inkerman). They clearly represent a new order in which there was no longer a place for Chersonesos.
Of particular significance in the city’s decline may have been the development of the port of Kalamita, northeast of Chersonesos, known since the 14th century, when it served both Genovese interests as well as those of the inland principality of Feodora, with its capital at Mangup Kale. Excavations should help to prove or refute the idea. In this context, it will be interesting to chart the distribution of Valencian lustre ware, which seems to be a constant find on sites in the Mediterranean and the Black Sea that were occupied by the Genovese or that entered within their trading orbit. Furthermore, it would be interesting to see how much the economic decline of Chersonesos may coincide with the gradual agricultural de-intensification in later Byzantine times recently evidenced by the study of sediment cores from nearby Chernaya Balka (see Paul Lehman and Carlos Cordova in this volume).

The success of the fieldwork season has exceeded our greatest expectations, and it would be a great pity not to build upon the foundations that have been laid. On the archaeological side, the excavation of the entire insula or block of the ancient city, which should be defined by four streets, is the primary objective. This means examining all archaeological phases, from the late Byzantine buildings uncovered this year, down to the initial Greek occupation of the site. Once completed, conservation, restoration, and possibly reconstruction can take place so as to present the site to visitors and tourists in an easily comprehensible manner, thus laying bare a slice of the history of Chersonesos.

Alongside modern excavation, a great need is finds analysis using up-to-date and experimental criteria. In particular this concerns the numerous animal and human bones that are being unearthed. Potential information is enormous, regarding the economy, nutrition, the environment, and the state of health of the population. If DNA survives, work can also be performed on genetics and illnesses, many of which leave no osteological traces. Other classes of finds, in particular the pottery, could do with compositional analyses, so as to shed light on provenances and technologies.

However, the importance and novelty of the excavation lies not only in the archaeological results, but in the training and methodology employed and in the creation of a system based on information technology for the recording of excavation data in real-time (see below). In regard to training, the state of the art techniques and methodology employed during the project have not only led to a thorough and efficient recording of the archaeology of part of the ancient city, but have also provided an ideal framework in which to train students of archaeology. A program of workshops by both local and visiting archaeologists was established this season to provide on-site training in excavation methodology and recording. These included demonstrations in the use of the total station and site GIS and context sheets, as well as seminars on the history of archaeology, on the Harris matrix, on ceramics, and on the significance of soils in archaeology.
Top left: Tile with the stamped decoration of a horseman, possibly St. George. Height 16.2 cm. [cw]

Top right: Byzantine tombstone found in the street rubble. Height 21.6 cm. [cw]

Bottom: The iron signon or processional cross from room 21, before and after conservation. Height 47.5 cm. [cw; NPTC]
Below, Byzantine ceramic cooking stand, height, 35.5 cm. [cw]

PLATE II

Right, pottery fragments. [cw]

Work at the site, July 2001. [cw]
Figure 2.13. Glazed wares from the abandonment layers: Zeuxippus ware dish with a falcon (PA 78[190]), diameter 14.8 cm (see plate II).

Figure 2.14. Pottery from above the collapsed rubble. From top, brownish-yellow glazed bowl (PA 1 [50]), diameter 12 cm; vessel with an interior brownish-yellow glaze (PA 1 [53]), diameter 19.2 cm; brownish-yellow glazed jug (PA 2 [38]), overall diameter 18.8 cm.

Figure 2.15. Amphora from the abandonment layers with letters scratched below handle. Perhaps from the northern coast of Turkey (PA 18[144] SF43), diameter 33.8 cm.
Figure 2.16 The site at the beginning of the season with surface vegetation removed. June, 2001 [A. Sobotkova]

Figure 2.17 The excavation team on site, late July, 2001. [cw]
A number of new techniques were explored this season during excavations in the ancient city at Chersonesos to improve our system of data recording and on-site mapping. Specifically, we were interested in the use of Geographic Information Systems (GIS) technology as a tool for managing the large amounts of disparate spatial data generated during excavation.

GIS is typically used within archaeological projects at the regional or landscape scale, but a handful of publications have recently surfaced that describe projects using GIS at the micro- or intra-site scale for managing excavation data. Analogous to a regional scale GIS, which locates individual sites with specific sets of attributes and geographic locations within a landscape, an intra-site GIS locates individual elements (artifacts, walls, rooms, stratigraphic units, etc.) within a so-called “sitescape.” These individual items or components, like sites within a landscape, have specific sets of attributes and locations within a site and can be organized and analyzed in much the same way.

Our motivation in applying these methods at Chersonesos was primarily practical: namely, to streamline the process of on-site mapping, data recording, and data management during the field season, as well as to facilitate post-excavation analysis (especially challenging for our increasingly international team) and to speed the presentation and publication of results. We were able to successfully integrate a wide range of disparate data types, including digital mapping data collected with an electronic total station, digital photography, paper maps and plans, as well as a large amount of tabular data housed within a relational database (developed by Giuseppe Gravili—see below). Using ESRI’s ArcView 3.2 GIS software, these tasks were greatly facilitated, and we plan to implement it as a standard component of our excavation toolkit.

The system allows for convenient and rapid production of daily top plans (figure 2.19). For this type of daily plan, total station points were collected at corners of walls and at boundaries of excavation contexts, which were then digitized to create polygons. The result is tidy, labeled, highly accurate, and easily updated schematic top plans, which proved extremely useful for daily excavation work. In addition to two-dimensional planimetric mapping, topographic points were also used for interpolating three-dimensional surfaces.

Individual small finds were also recorded with the total station and given a unique identifier key that was linked with an entry in the artifacts database. Each dot on the map, then, contains detailed descriptions and can also be easily linked to other databases of digital photographs, drawings, or comparanda (figure 2.20).

Finally, for the general site plan, we also integrated hard-copy architectural plans, both from previous excavations in adjacent areas and from a series of detailed stone-by-stone architectural drawings created by Max Limoncelli throughout the season (figure 2.21). These drawings (62 in total, each drawn at a scale of 1:20) were scanned and, using tie points collected with the total station, rectified and georeferenced using ENVI (a digital image processing software package). Each of the drawings were digitized within AutoCAD to create a vectorized stone-by-stone plan of the site architecture that could be easily integrated into the site GIS.

The advantage of this system is its fluidity and adaptability. Not only does it serve as the glue that binds together large amounts of disparate data, but it also gives us the ability to visualize large amounts of data in a variety of different ways. Maps can be created extremely quickly according to different criteria (such as with distributions of specific types of artifacts, or representing different building phases) and at any scale. This is not just a convenience for day-to-day and season-to-season excavation work, but it also facilitates the process of presenting and publishing results. Furthermore, in contrast to static, stand-alone maps and site plans, this system can be up-
dated quickly and painlessly as new data and results come to light during later analysis or excavation.

As with anything new, some of our methods were met, at first, with reluctance on the part of our local collaborators. By the end of the season, however, there was a long list of students and senior archaeologists working at the preserve who were eager to receive training on the use of these techniques. As we refine the system, and as more of our collaborators become familiar with it, we hope to establish a more standardized method of site recording, data management, and storage that can be implemented at a number of other ongoing projects conducted by our joint excavation project. This will, we hope, improve our ability to share information and results with other archaeologists in the region and beyond, ultimately contributing to a better cumulative understanding of the archaeological record at Chersonesos and the potential of GIS.

Figure 2.18. Alessandro Rizzo taking top elevations with the total station. Inset: table of readings generated.
Figure 2.19. Daily top plan created (in ArcView software) by digitizing point data downloaded from the total station.

Figure 2.20. Mapped artifacts and their associated attributes (linked from the relational database).
Site planning, together with photographic documentation and the written record, forms one of the three principal methods by which any archaeological evidence, such as a structure, a layer of soil, or an object, can be extracted during an excavation (figure 2.22). The graphic documentation through survey and site planning provides a description in the form of plans, sections, and elevations, by various methods from straightforward triangulation to more complex forms such as photogrammetry. This consists not only of the simple operation of measurement and graphical reproduction of an archaeological or architectural element, but also of the more complex operation of analysis to represent all architectural components, such as dimensions, geometry, structure, and construction. This graphic documentation thus becomes an instrument for the study of ancient structures that can be read stratigraphically, from elevations to the study of wall typology, to arrive at the technical analysis of monuments through virtual reconstruction of the buildings, often with the use of a computer.

At Chersonesos the graphical documentation was conditioned by the creation of an excavation GIS, for which it was necessary to realize a vectorial survey with the use of a suitable CAD program. GIS is an instrument for computerized topographic studies for the viewing and modeling of data in their geographical position. In contrast, CAD, created for computer assisted architectural projections, is an instrument that serves to create new information under the form of geometrical representation of real structures. Thus, to obtain a GIS with a high graphic definition of excavated structures, we sought to integrate the functions peculiar to GIS (see Trelogan, above) with the graphical power of computer-aided design (CAD). Many previous GIS realizations of excavations have been limited.

Figure 2.21. Stone-by-stone architectural drawings, geo-referenced and vectorized for display within the site GIS.
by the representation of architectural and stratigraphic
evidence in an extremely simple manner. Often this is in
the form of primitive geometrical shapes such as rectangles
or polygons, indicating only the general form of walls and
features. In the Chersonesos GIS system, particular em-
phasis was placed on the need to possess the details of
structures, which were recorded and displayed stone
by stone, guaranteeing the same graphical quality as
the traditional ink drawing.

It was initially decided to document structural sur-
veys of previously excavated sites, the current exca-
vation, cross sections, and tombs. This was then
supplemented with the graphical documentation of
layers and small finds, carried out with a total sta-
tion.

In six weeks of work a general plan of all structures
in the four areas was produced, for a total surface
area of 2,200 m², through sixty-two plans at the
scale of 1:20, using the traditional method of trian-
gulation. Day by day, each plan was positioned in
the reference system created with a total station and
geo-referenced with the image processing software
ENVI. Finally, all the plans were vectorized with
the AutoCAD 2000 software. Thus an updated
general plan of the archaeological site was available
in real-time. Adela Sobotkova produced elevations
of the Roman cistern and the city walls, using the
photogrammetric software Photomodeler. Other ele-
vations were produced through direct planning—at
1:10—for documentation of the structures brought
to light in the excavation.

There was not time enough to draw elevations of all
the structures, enabling a study of the evolution of
monuments, but this is one of next season’s objec-
tives. A second aim is to produce a typology of the
masonry used at Chersonesos. A further objective is
that of producing a hypothetical reconstruction of
the excavated insula by computer. It is hoped that in
the future a new general plan of the city—including
the architecture previously unearthed—will be
produced with the same methodology used this year.
This would further permit virtual reconstructions of
Chersonesos through the ages.

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**Figure 2.22. Max Limoncelli documenting excavation details on site.** [CW]
At the start of the season at Chersonesos, with the help of Taissa Bushnell, a small building—strategically placed near the Museum, the National Restoration Laboratory, and the excavation site—was chosen and outfitted as the finds laboratory. It proved to be appropriate because adjoining it was a large enclosed garden in which tables could be set for working on finds. Inside, one room became a computer laboratory, while in another, work spaces were prepared for a draftsperson and for the Finds Laboratory Supervisor. In this latter room two main areas were organized, one for finds as they arrived daily from the excavation and one for their storage. The staff working on archaeological finds consisted of the writer and three draftspersons—Irina Don and Irina Gusakova from the National Preserve and Giuditta Cavallo of the University of Lecce—and two local archaeologists, Olga Andreeva and Andrei Sazanov, who prepared a register. Because of the considerable amount of pottery found during excavation, the work of the Ukrainian staff continued after the end of the excavation season.

Pottery and bones were brought to the laboratory already separated from other finds. To provide real-time information on the finds, they were washed every day. This was coupled with a teaching program on pottery analysis by arranging a rotation among excavation participants to work in the laboratory. During this phase, the laboratory supervisor provided collaborators with explanations about the contexts on which they were working and methods of classification. After drying, ceramics were restored with water-resistant, reversible glue, while artifacts that required particular care were entrusted to the Restoration Laboratory. Following this, a preliminary study of each context was made by recording the presence of different pottery wares and types, so as to provide provisional chronologies. This also permitted an assessment of the reliability of each context by considering the entity of residual or intrusive elements. Information recorded for each context included presence of animal or human bones, organic and inorganic materials (such as charcoal or plaster), soil samples for analysis, tiles, waste from “industrial” activities, and the state of preservation of finds. Particular fragments were also selected for drawing. The rest, divided by type, was put in marked bags and stored in marked wooden boxes. Apart from tiles, no finds were discarded, even from surface contexts. The large amount of daily work precluded analytical quantification of each context.

During the season many roof collapses were excavated, and every day a massive quantity of bricks and tiles was brought to the laboratory to be examined and quantified. After sampling, the remainder was discarded in a specific excavation dump. The quantification was necessary for a proper evaluation of each context, and we followed the conventions of Orton, Tyers, and Vince. Their system was adapted for the specific problems of tile quantification in Chersonesos, where tiles were often decorated with crosses, monograms, and human figures (including, perhaps, St. George—see Plate I). Tiles from each context were divided and quantified as bricks, pipes, roofing tiles, and decorated tiles. Fabrics were examined and sampled. The better examples were documented with drawings and photographs. All told, 39,628 fragments were quantified, equivalent to over 1,923 kg in weight. Together with the study of architectural fragments—both decorative and structural elements—this exacting work of evaluating number and weight of tiles in each collapse and sampling shapes and fabrics will aid virtual reconstruction of the buildings.
A complex part of the laboratory work concerned small finds (SF). Supervisors on site had the responsibility of assigning SF numbers to particular finds. Each day, all small finds were examined and some were removed to the Restoration Laboratory. We entered data collected in the field on a SF list, complete with information on photographs, drawings, and location, as well as on function, typology, size, and state of preservation (all to be recorded in the database). This was a lengthy procedure as 811 objects were discovered, few of which were well preserved. This data was indispensable in supplementing the three-dimensional recording of each small find in the field. Thus, for instance, it is now possible to visualize the precise position and distribution of all iron nails (total 419), through interrogation of the database and the excavation GIS. With typological distinctions of finds, it is possible to analyze the functions of different areas on site.

Inside the laboratory, spaces were organized for drawing and photography. All told, almost 4,000 detailed drawings were made by Irina Don and Irina Gusakova and some 200 by the Italian team. All drawings were marked with a number and recorded in a list containing the following information: sequential number, context number, object, small finds number, photo number, check, date, author. The drawing number was written on each piece in square brackets. All this was recorded in the computer database.

Photography was performed by Chris Williams. For easy importation of images into the database, a digital camera was used, while a film camera was employed for selected finds. Each shot was numbered and recorded on a list with the following items: number, type (photo or slide), SF, context, object, drawing, author, and date. Each image included a metric scale and a label with the picture and find numbers. A total of 336 pictures were taken.

At the end of the excavation all artifacts had been washed and examined, more than half the bones cleaned, all small finds recorded and described, and much had been photographed and drawn.

Finally, it is worth emphasizing the importance of the on-site Finds Laboratory provided by the Preserve, operating simultaneously with excavation and allowing the daily processing of large quantities of finds. This has proved to be extremely useful, providing the archaeologists with an immediate guide to the interpretation and chronology of the site and also creating a basis from which to continue analysis of context and materials.

The Laboratory of Medieval Archaeology at the University of Lecce is currently involved in developing a Digital Data Acquisition System, which aims to manage and interconnect any type of information that archaeological research can generate: alphanumerical data, spatial data, and images/multimedia. In this context the relational database represents the starting point but also the heart of the system. Without it, the content and all that holds it together would be missing.

To make the computer system responsive to all user needs, it was necessary to involve the users from the start of the design phase. This was accomplished through a series of interviews with individual specialists or with people from differing sectors, with the goal of establishing the information that they wished the system to deal with and the type of answers that they hoped to retrieve from the system.

The relational model was chosen, the same which has been used and found effective in all the research projects until now that have dealt with automatic handling of data, and which is seen by humanists as being the model which faithfully reflects the inter-relational connections that occur in reality (figure 2.24). Furthermore, from an archaeological viewpoint, this model meets the research criteria that often require modification of initial variables or new informative elements.

In order to create this system several design criteria were considered and informative specifications were requested by users:

- Automatization of the current information system: computerization must try to optimize methods of documenting and archiving data without revolutionizing them.
- The ability to go beyond the limits of a single research project: many database systems designed to manage excavation data used in the past have not been able to overcome this impasse and have been limited to the individual project for which they were designed.
• A link to specific image archives.
• Status-of-information check on new data before it is recorded.
• Improved accuracy of data entry and language standardization, enabling users, where possible, to choose values from a list.
• The possibility to integrate the system with a GIS (Geographic Information System).
• A check on suitability of information to avoid incorrect data entry.
• Multilevel access according to user type, to ensure database security.
• Simple and easy-to-learn user interface.

In the choice of software used to create the application, a series of factors, which we can call environmental, were taken into consideration, including the existing operating system, the volume of the data to be managed, its growth-rate, and the number of users that the system has to support. After examination of these requisites, Microsoft Access was chosen because it is a fully functional relational database offering all the characteristics of definition, manipulation, and control of data that are necessary to manage large volumes of information. Even though it is essentially a desktop database, it has characteristics that render it functional in a client/server environment on a small network. For laboratory needs it proved to be particularly suitable for creating a functional product in a limited period of time.

In order to render the interface user-friendly, prototypes of data-entry forms and reports were made for user testing. Their comments, needs, and suggestions were taken into account in the choices made when creating the final version. In order to have an objective insight into the validity of the system, practical application on site was both necessary and useful. Thus the Chersonesos 2001 excavation project was a suitable testing ground for trying out the database system, with the aim of verifying its functionality on site. Using the database was part of a vast and articulated process that saw specialists from different disciplines and activities working on a project coordinated for digital data acquisition, with the objective of creating an excavation GIS (figure 2.25). (See Trelogan, above.)

Thanks to the database it was possible to manage the excavation’s alphanumerical documentation in real-time. In fact, each day’s incoming data dealing with stratigraphic context, artifacts and graphical documentation were fed into the system. This not only dramatically reduced the time needed to archive data, but also made it possible to carry out checks and research on the data easily and quickly. It was also possible to produce daily reports with up-to-date information, which were extremely useful to the archaeologists on site. At the end of the seven-week excavation, a large part of the data regarding 312 stratigraphic contexts, 811 small finds, and 62 site drawings had been captured.

During experimentation we verified the possibility of integrating the database with a bigger and more innovative system of managing archaeological data, the excavation GIS. The alphanumerical data, which describes the properties of the different spatial entities memorized in the GIS (like points, lines and polygons), were in fact conserved externally in the relational database. The descriptive information was

Figure 2.24. The entity-relationship diagram.
thus linked to the graphic elements using identifying codes that constitute the unifying element of the two data banks and permit the interchange.

If, in the future, there is an increase in the volume of data and the number of users of the system above that which has been predicted, we will consider the possibility of getting Access to interact with Oracle, a powerful and sophisticated database created for the development of complex client/server applications. Furthermore, to overcome problems linked to integrating data from different sources, as, for instance, in a cross-platform system, a new research direction could be offered by the opportunities that developing network technologies provide.

Figure 2.25. Digital data acquisition model for the Chersonesos excavation.
Archaeological excavation implies the destruction of archaeological deposits and contexts, which also means that the only surviving data (excluding objects and structures) will be that documented in the field. The data, therefore, becomes the primary source for the study of the archaeological sequence. It follows that the documentation of each single context must be as objective as possible. To attempt objectivity the documentation has been formalized through use of protocols or context sheets.

The use of a context sheet in documentation has highlighted the difference between archaeological methodologies of the Russian-Ukrainian school and “western” school. In Russian-Ukrainian archaeology—at least that with which we have been in contact—the registration of data takes place through daily compilation of a site notebook without the use of context sheets. We accommodated this difference in style by translating the fields of the context sheets into Russian and by compiling them, together with the Ukrainian archaeologists. This yielded results both in the production of bilingual documentation and in the interest shown by the younger generation of Ukrainian archaeologists in “western” archaeological methods.

A context sheet is compiled during the excavation of each context. This sheet consists of various fields, including the site name, excavation year, and location within the site. These are followed by the code for the site and locality, the number of the room in which the context was found, an Arabic number identifying the context, and a field to indicate whether the context is artificial or natural.

Additional fields include:
- Context type
- A field for color, compiled by reference to the tables of the Munsell Soil Color Chart.
- A “description” field. (This poses a problem with subjectivity—some archaeologists produce verbose texts, confusing context descriptions with interpretation. The problem is not negligible, as registration of data in the field must be conveyed to the database in a fashion that responds to specific search criteria.)
- Other fields include: stratigraphical sequence (the chronological relationship with other contexts); presence or absence of particular classes of finds such as animal bones, shells, paleobotanical material and small finds; plans, sections and photographs.

A site diary was also maintained to record general notes that have no place in the context sheets such as preliminary hypotheses about the site and its contexts.

The written data is completed by a series of preprinted sheets. This series of sheets comprises six different lists, to be compiled in the field, one each for context numbers, small finds, room numbers, burials, skeletons (articulated individuals), and plans and sections. Each list contains a limited number of essential fields. For instance, the small finds list has the SF number, context number, the object type, a brief description, and its total station coordinates. Its purpose is to provide a checklist of identification numbers for use on site or in the laboratory without always having to resort to a site notebook or to the far bulkier database. Though these lists are available to supervisors as printed sheets, in future we hope to provide all supervisors with portable computers for field use linked by a local area network (LAN).

The fundamental problem posed during the season at Chersonesos has been that of standardizing the data registered in the field with the requirements of the database. Data collection in the field and data entry into the database, while running parallel, must necessarily communicate. Perhaps the most complex part of the entire task of registering the data was the dialog between archaeologists and the appearance of problems that are not always envisaged by those who fill in context sheets. If this has further complicated the process of site documentation, I believe that the necessity to satisfy requirements of an information system has led to more objective data collection. On the basis of the experience at Chersonesos, we now believe that, apart from ease of data management, the database forces field archaeologists to further rationalize their work.
This year marks the final stage of ICA’s NASA-funded project conducted, since 1998, in collaboration with the National Preserve of Tauric Chersonesos (NPTC) and the University of Texas Center for Space Research (CSR). The main objective of the NASA project has been to investigate the use of remote sensing and Geographic Information System (GIS) technologies for mapping the ancient territory at Chersonesos, as well as for monitoring threats to the area’s preservation.

Despite over a century and a half of intensive archaeological research at Chersonesos, it is still extremely difficult to come by any accurate plans of the chora in all its complexity. Most of the published plans of the territory’s ancient cadastral grid are highly schematic, and they rarely take into account the natural topography of the landscape. Thus, the creation of a detailed, comprehensive map of the entire ancient chora has been a major goal of the Preserve (a task the staff has been working on for the last three decades).

Galina Nikolaenko, Deputy Director of the Preserve, has been the driving force behind this effort. She has done an extraordinary job of compiling previous mapping efforts, field survey, and her own interpretations of a number of aerial photographs, and has created the most detailed plan to date for the territory. The result, although it is a major improvement on previous attempts to reconstruct the ancient chora, is a series of stand-alone paper maps that are limited both chronologically and thematically. Furthermore, it does not document which areas of the territory’s archaeological record are no longer extant due to:

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**Figure 2.26.** Historic aerial photograph (1960s) of the peninsula between Omega and Streletskaya Bays.
to the rapid urban and suburban growth in and around Sevastopol. Because one of the major goals of the joint projects of ICA and the Preserve is the creation of an archaeological park at Chersonesos, a crucial component for its realization is a plan of the territory that not only records the extent of the ancient remains, but also documents its existing conditions.

To address some of these issues, we began looking into the possibility of creating a territory-wide GIS that would incorporate all of the disparate types of information that have been generated during the site's long history of archaeological research with the results of current research and excavation. This would include not only archival hard-copy maps and site plans, reports, and photographs from previous excavations, but also new, mostly digital data from the ongoing components of our joint project.

Unfortunately, the proximity of the site to the highly sensitive military bases in and around Sevastopol has made it difficult to obtain any detailed and accurate modern maps (especially with detailed topographic information) that would serve as the geographical base of the GIS. The advantage of the site’s military position, however, is an abundance of imagery available for the region (p. 47, top). During the height of the Cold War, Sevastopol was perhaps one of the most frequently monitored regions in the former Soviet Union, and now that these tensions have waned, data collected for military reconnaissance is becoming increasingly available for scientific research.

This is in part what interested NASA in our proposal to evaluate a wide range of remotely sensed data as a potential tool for archaeological research and cultural resource management. The first phase of the NASA project was the creation of a geo-referenced database of imagery from a variety of space-based and airborne sensors—ranging from World War II-era aerial photography to recent high-resolution digital satellite imagery. This data would not only provide a spatial framework that would serve as the glue to hold together all of the other information we hoped to integrate (and this has been one of its great advantages), but the imagery itself has also proved to be a valuable resource for extracting information about both the cultural and natural landscapes of the territory. Each of the different data types—acquired at a range of spatial resolutions and spanning over a half century—provides a different type of information, which, taken together can contribute a great deal to our understanding of the site’s landscape history.

Historic aerial photographs are the best source for extracting archaeological information, and scholars interested in the territorial divisions at Chersonesos have been using them extensively for decades. These aerial photographs’ low altitude, high resolution, and era—pre-dating much of the region’s recent urbanization—make them an ideal source for mapping archaeological features (figure 2.25). Unfortunately we do not have a complete set that covers the entire peninsula. Also, field checking of photo-interpretation is now impossible in many areas because of the extensive landscape modification that has taken place in the last few decades (figure 2.27).

Figure 2.27. Urban expansion in the Heraklean Peninsula: close up of the 1968 CORONA satellite photograph (left) and the 2000 image from the IKONOS satellite (right).
As is clearly visible in figure 2.27 (comparing a recent satellite image from 2000 with an earlier image acquired in 1968), urban expansion around modern Sevastopol has been substantial. Thus, in many places, existing maps of the territory’s grid of dividing roads have been extrapolated in areas not covered by the photographic record or now buried under modern construction. It is now possible to confirm and correct the maps of many of these areas using satellite imagery that provides a more synoptic view of the landscape.

Most useful for this task has been a set of high-resolution satellite photographs from the recently declassified CORONA reconnaissance missions, 1960–70 (figure 2.28). The CORONA satellites were used primarily to monitor activities in the Soviet Union during the Cold War. This data, like the aerial photography, predates much of the region’s urban growth, so it provides an equally valuable historical record. Although, due to the satellite’s altitude, the CORONA photographs are lower resolution than aerial photography, what the CORONA data lacks in detail is made up for by its seamless coverage over a large area. It is, in fact, detailed enough to identify the majority of the chora’s major dividing roads and a large portion of the interior plot divisions.

Other digital optical data, such as our newest acquisition, a 1-meter resolution IKONOS image, has proved to be valuable for identifying individual sites—excavated and unexcavated—as well as ancient roadways and agricultural planting walls not yet lost to urbanization (figure 2.29). The IKONOS data has also been an invaluable tool in the planning stages of the Archaeological Park.

Landsat multispectral data (which has a fairly coarse 30 meter resolution) has been used to extract environmental information, for example on vegetation and soils, as well as to monitor recent landscape change. We obtained a series of this data, ranging from the early 1980s to 2000, which we have used to map the rate of urban and suburban growth that has taken place in the last two decades, primarily since Ukraine gained independence in the early 1990s (see 1999 Annual Report).

The image collection and analysis phase of the project has been somewhat more time consuming than we had anticipated, due to a number of obstacles (most significant of which has been our inability to obtain the proper permissions to use accurate GPS equipment in this militarily sensitive area). We have, nevertheless,

Figure 2.28. CORONA satellite photograph from September 1968
learned an immense amount about a specialization that we, as archaeologists, were relatively new to, and we have extracted a great deal of useful information that has already added to our cumulative understanding of the territory. Now, we are not only well equipped with a host of new skills, but we also have an excellent spatial framework into which we have begun to integrate other information about the archaeological record.

As a starting point, the results of Nikolaenko’s map of the 4th century BC land division system were digitized (see 2000 Annual Report). Based on a combination of existing published materials, older, archival maps (from as early as 1786), aerial photography (where available), and ground survey (where possible), Nikolaenko has mapped in detail over 200 plots in the central and northwestern parts of the peninsula. Nikolaenko’s hand-drawn maps (which were done with pencil on tracing paper at a scale of 1:5000) were all individually scanned and, using tie-points in the satellite imagery, geo-referenced and then digitized into vector layers representing the major roads, planting walls, farmhouses, and fortifications that comprise the ancient chora. With the vector layers laid over the CO-RONA data, the reconstructed cadastral system can now be compared with what is visible in the imagery and corrected where necessary (p. 47, bottom).

There are a number of different interpretations of this division system, and about four different numbering systems for identifying plots and farmhouses within it. We plan to incorporate these maps into the GIS as well, so that they can be conveniently juxtaposed and easily compared, as well as cross-referenced according to all of the different numbering systems that appear in publication. This will serve as a useful data management tool greatly facilitating our research. It will also be an invaluable way of preserving the rich history of archaeological research done at the site, a treasure in its own right.

In addition to mapping the cadastral system, we have also begun trying to accurately locate individual farmhouses and other structures within the chora. While the resolution of the CORONA data is adequate for mapping roads and field boundaries, individual buildings are not typically discernible. The 1-meter resolution IKONOS image has been a great resource for this task. A number of previously excavated and some still-buried structures have been located in the imagery. The use of GPS (assuming permission to use it) would greatly improve our ability to fix positions accurately. But because the imagery is georeferenced, we can locate their positions to within approximately 30 meters, which is a major improvement on the existing schematic maps.

We are currently developing a relational database that will include as much information about each individual site and farm plot as is possible to reconstruct from the available published literature and archival material housed in the Preserve. When these databases are linked with the GIS, each dot or line on the map will contain information about the chronology, physical characteristics, and function of the feature, as well as details about when and by whom it was excavated or mapped, the associated published or archival material, and its current state of preservation.

Some sites, particularly those of our joint excavation project, are being mapped with more detail than previously excavated sites. Using a multiscale approach that integrates data from micro-scale digital mapping (see “Excavation GIS” section above), we plan to integrate this level of detail within the larger context of the regional-

Figure 2.29. Detail of IKONOS imagery (March 2000) over Yukharina Balka, indicating Farmhouses 151, 132, and 150 north and south.
scale GIS. Thus, at sites that are now being mapped digitally (with the use of an electronic total station), we will be able to move seamlessly from the level of the territory down to the level of the individual artifact.

Finally, we are also conducting an extensive program of electrical resistivity surveying aimed at mapping subsurface features at a number of different sites in the chora (see “Electric Resistivity” section below). This data, too, is tied into the digital mapping grid created with the total station and so can be integrated into the GIS.

Although the NASA project is still a work in progress, the products created and methodologies developed have already become useful tools for our own data management and analysis, as well as for the presentation and publication of results. We are now well on our way toward making the vast resources housed in the archives of the National Preserve more manageable and accessible for everyone working at Chersonesos. Our ultimate goal is the widest possible dissemination of information through Web-based publishing, which we hope will facilitate a more collaborative approach for archaeologists working in both the Black Sea region and farther afield.

Figure 2.30. Jessica Trelogan checks the total station’s readiness for field use. [cw]
A map of the Heraklean Peninsula by N. M. Yanyshev, ca. 1935. From the Preserve archives.
Since 1997, a joint project of the Preserve and ICA in the chora of Chersonesos has employed ground-based remote sensing (electrical resistivity, magnetometry, and ground penetrating radar) to investigate and map archaeological sites. To date, remote sensing has been carried out at Sites 151 (1997), 133, and 150 (2001), all located along Yukharina Balka, and at the hilltop site of Bezmyannaya (1998–2001) on the eastern margin of the Chersonesan chora. Sites 133, 150, and 151 are all located within an extensive (300+ acres) area of well-preserved ancient farmland that is owned and managed by the National Preserve and that is destined to form the heart of the proposed archaeological park. The program of ground-based remote sensing is conducted by a collaborative Preserve-ICA team, directed by Preserve staff member M.Y. Nikolaenko and by S.V. Shakuro of the Ukrainian firm Vogageologiya. In 2000, a grant from the Packard Humanities Institute allowed acquisition of a Geoscan RM15 electro-resistivity meter equipped with a PA5 probe array and a portable digital data logger (figure 2.31). For the past two seasons, the remote sensing team has relied heavily on this instrument for its non-invasive mapping of cultural features at Bezmyannaya and Sites 133 and 150. At Bezmyannaya alone, resistivity survey campaigns over the past two seasons have covered an area of 1.4 hectares (3.5 acres), with impressive results.

**Figure 2.31.** Schematic diagram of a Geoscan resistance meter for mapping ground resistivity. [Jodi Lane after Geoscan Research Instruction Manual. © 1991–1996 Geoscan Research, Inc.]

**Figure 2.32.** Mikhail Nikolaenko (right) and assistant use resistance meter at Bezmyannaya, June 2000.
Briefly, electrical resistivity profiling measures variations in the relative conductivity of buried soils. The resistance meter consists of two pairs of electrodes connected to the data logger. One pair (mobile probes) is mounted on a mobile frame, and the other (remote probes) fixed in the ground at a distance from the survey grid. The device sends a pulse of electrical current through the remote probes and into the ground surface and measures and digitally stores, in the portable data logger, the strength of the current as it passes between the remote probes. The depth below ground surface at which resistivity readings are taken is a direct function of the distance set between the remote probes—the more closely spaced the remote probes, the more shallow the passed current. Typically, moister and more loosely packed soils, such as fill within subsurface excavated features (trenches, pits, robbed-out

Figure 2.33. Shaded relief map—representing below-ground variations in electrical resistance—of the western flanks of Bezymyannaya Hill, 2000–2001. [M. Nikolaenko, S. Shakuro, et. al.]
walls), are characterized by lower resistivity values as such deposits more readily conduct an electrical current. Harder and more compact features (stone architectural remains, for example), on the other hand, impede the electrical current and are thus more highly resistant. The resistivity data collected in the field and stored on the data logger are downloaded daily to a computer where, following processing with a geophysical data processing software package (the Preserve-ICA team uses GeoPlot 3.0), they can be merged with existing results, displayed visually, and interpreted. Additional data processing takes place in the laboratory allowing for more detailed interpretation of the detected features.

Results
Survey with the GeoScan RM15 electro-resistivity meter was performed over a 1.4 hectare area across the summit and western flanks of Bezymyannaya hill in 2000 and 2001. Figure 2.33 presents a shaded relief map that displays the integrated results of this campaign. A number of linear features, many of which are clearly of cultural origin, are discernible in this image. In addition to the extensive structure surrounding the “fort” area at the summit of the hill, other notable features include:

- A square structure located west of and down-slope of the main excavation area. A trial sounding, excavated in July 2000, uncovered three burials in this area, which are believed to be part of a domestic necropolis whose stone enclosure, constructed without mortar, has disintegrated over time. The remains of this wall appear in the resistivity profile, although no indication of it is visible on the ground surface. Further validation through excavation of this and other areas are planned for the 2002 campaign.

- A roughly northwest–southeast trending wall that, quite probably, marks the boundary of an agricultural plot. Evidence of this feature is also visible in aerial photography, but not on the ground.

- Two closely spaced, parallel features of high resistance intersect the above-mentioned wall at roughly right angles in the northwestern portion of the surveyed area. Judging from the distance between them, these features, labeled Walls 3 and 4, probably lined a road that may have led from Symbolon Limen (Balaklava) to Chersonesos. Neither of these two walls has left any indication on the modern ground surface.

This report is accompanied by two 3-D visualizations of the resistivity results (figures 2.35 and 2.36) and an actual view of the topography of the hill taken from a helicopter (figure 2.37). During the 2002 field season at Bezymyannaya, excavation will focus on these possible down-slope features in an effort to address uncertainties about their dates and functions.
Figure 2.36. Interpretation of electrical resistivity survey results—indicating possible agricultural works and divisions—overlaid on a 3-D shaded relief map.

Figure 2.37. Aerial view of Bezymyannaya, the hilltop, and open excavation of the fortification. [J.C. CARTER & G. M. NIKAENKO]
Paleoecological research in the Heraklean Peninsula includes palynological and geomorphological components aimed at reconstructing past landscapes in the chora of Chersonesos and adjacent areas. In the summer of 2001 field tasks included sampling and description of profiles, and sampling of soil surfaces for modern pollen rain testing. In addition, modern pollen for reference collection was sampled directly from plants identified in the field and plant specimens at the Herbarium of the Nikitsky Botanical Garden. We are thankful to Dr. Vladislav V. Korzhenevsky from the Nikitsky for his cooperation on this project. We also thank Drs. Natalia P. Gerasimenko and Zhanna Matviishina, from the Institute of Geography at the Ukrainian National Academy of Sciences, for their usual frank and friendly collaboration. Thanks especially to Dr. A. A. Kluikin from Tavria University in Simferopol for generously sharing his knowledge of Crimean geomorphology and history. The contributions of all three are reported below.

Five research locales from the Heraklean Peninsula are reported here: section AA in Yukharina Balka, Bezymyannaya Heights, section BBBP in Balka Bermana, and cores NG2 and SB in the Chyornaya River (see figure 59 in 2000 Annual Report). Of these, only the analysis for section AA and Bezymyannaya Heights have been completed. Although pollen counts from BBBP and NG2 are not finished, they already suggest trends, which will be briefly presented here. In addition, Dr. Gerasimenko has analyzed a core from the sediments of Lake Saki in western Crimea. The importance of this core is that it provides paleoenvironmental information for a region known to have been part of the agricultural hinterland north of Chersonesos, as well as an independent record of regional paleoclimate. The core and some preliminary results are presented below. Further results and their implications will be discussed in forthcoming articles.

Main research questions in palynological research
Pollen analysis provides archaeologists with information regarding the crops that provided food and clothing for ancient societies. It also provides useful information on the landscapes that surround archaeological sites. Although the original purpose of this research was to study vegetation change around the time of Greek colonization, the amount of material gathered will allow us to reconstruct the history of vegetation in the Heraklean peninsula for the past 10,000 years.
One of the problems for the study of pollen in the Heraklean Peninsula is the lack of deposits that traditionally are studied for fossil pollen, that is peat bogs and lakes. For this reason the first phases of this investigation consisted in the testing of several other types of deposits for pollen. Thus, most of our information comes from soils, as well as alluvial and colluvial deposits. Although preservation is relatively poor in some cases, in most samples it is possible to work with a large number of pollen grains. Identifications can be made to the degree of genus and, in a few cases, to the degree of species. For purposes of space in the diagrams, most of these taxonomic groups have been put together in families.

Section AA Yukharina Balka
This section is located in the deposits of Balka Yukharina, about 200 meters south of Site 151. The section includes 2.5 meters of alluvial and colluvial deposits with soils developed in them (figure 2.39). The sequence of vegetation change interpreted from pollen in this section suggests a succession of changes in vegetation during the last 6,000 years (for example, a period of decrease in trees and shrubs suggests a relatively dry period). Between 5,000 and 3,000 years ago there are changes characterized by an increase in trees and shrubs, which suggest higher levels of moisture rather than evidence of a gradual deterioration of the environment.

This degradation could be caused by a dry period, intense impact from local populations, or a combination of both. The main signature of this period is the increase of herbs of the Labiatae and Liliaceae family, whose members prefer eroded lands and exposed bedrock. Better conditions subsequently return to the area, as indicated by an increase in the amount of trees. The diagram shows that at the time of the Greek colonization the area was covered by open woodland of oak and pistachio. There are no deposits known to be contemporaneous with the Greek colonization, but studies by Yanushevich and Nikolaenko on macrobotanical remains from other sites suggest intensification of agriculture based primarily on the cultivation of grapes, cereals, and legumes. Our pollen data suggests that walnut (Juglans) was also among the cultivars of the region at that time.

In the diagram, the deposit between 75cm and 25cm below the surface suggests the abandonment of farms and rapid regeneration of vegetation in Balka Yukharina. No date exists yet, but pottery recovered from it suggests that this period corresponds to the first half of the first millennium BC. Pollen spectra from the top 25cm of the section shows an assemblage of vegetation similar to the one seen today in the area.

Figure 2.39. Preliminary pollen diagram from section AA at Yukharina Balka.
Section SW Bezymyannaya Site

This section corresponds to the southwestern end of the excavated area within the Bezymyannaya site as it was in the summer 2000. The main objective of the study of this section was to test pollen content from a soil underlying the Hellenistic occupation in order to compare it with a post-Byzantine soil. These two soils are named the pre-occupational cinammonic and post-occupational chernozem (figure 2.40). Cinammonic soils typically develop in the sub-Mediterranean climate of southern Crimea, especially under conditions of open woodlands. Chernozems are black prairie soils, typical of the subhumid steppes of Eurasia.

The diagram shows that the pre-occupational cinammonic soil contains pollen assemblages that suggest open oak woodland and a series of herbs associated with open sunny areas. The assemblage is very similar to what the diagram at AA section suggests for that period. The difference is that the influx of alder (Alnus), elm (Ulmus), and willow (Salix) suggest a humid area nearby. We believe that the spring and wet meadow that exist today at the foot of Bezymyannaya previously maintained a dense grove of trees.

The post-occupational chernozem presents an assemblage of vegetation with few trees and abundant mixed herbs; in short, very similar to the vegetation that is observed at the site today.

Section BBBP

This is the longest section in terms of time covered. Although radiocarbon dates are still in process, three dates suggest that this section may extend at least to the end of the Pleistocene and beginning of the Holocene, roughly 10,000 years ago.

A series of soils are developed in the deposits. Pollen from the lower half of the section presents a vegetation cover that is very different from the one seen today in southwestern Crimea. The sequence shows a fluctuating and complex replacement of vegetation of colder and humid environments by warmth-loving vegetation. The upper half of the section shows a sequence of change similar to AA.

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Fig. 2.40. Preliminary pollen diagram from the excavated area at Bezymyannaya Heights
Lake Saki in western Crimea is an invaluable archive of past climate records in the form of both sedimentological and palynological data. The varying thickness of the layers, the chemical composition of the bands, and the pollen reflect climatic fluctuations over the past 5,000 years.

The first studies of the lakes were made in 1930s. Then, in the middle 1990s, a cooperative US-Ukrainian project (not affiliated with ICA) sought a long, detailed record of precipitation from the steppes of southeastern Europe. More than 50 cores were taken and analyzed in the lab, as were modern pollen rain samples. In order to establish an independent chronological framework for these studies and make them more useful to us, ICA provided two radiocarbon dates (3070±40 BP at 1.5m and 3670±40 BP at 3.1m). In context of the other results, the radiocarbon dates are equivocal, but clearly do not support previous chronological interpretations of annual layering in the banded sediments. Further work, including more dates, is necessary to establish a reliable chronological framework for what are striking fluctuations in temperature and moisture recognizable from the pollen data.

Assuming that the two radiocarbon dates are essentially correct, the pollen record establishes two main climatic events, an extra dry and hot phase of 3670±40 BP and a dry and cool phase around 3070±40 BP. These episodes can be correlated to the paleoenvironmental record in the forest-steppe and forest belts of Ukraine, indicating that Saki may indeed reflect regional patterns of paleoclimate.

Soils and geomorphology
Soil research during the past year has focused on the issue of matching soil typology with soil processes, both in current soils and in buried, ancient soils. To that end, we invited Dr. Zhanna Matviishina to the field to provide her expertise on soil micromorphology and Pleistocene soils. She took many samples from the key locales BBBP and AA and promises a full micromorphological report. Her visit, along with that of Dr. Gerasimenko, allowed us to integrate the previous year’s lab results and dates with four sets of eyes. The resulting data suggest a number of fruitful correlations elsewhere in the Crimea and Ukraine that are essential to establishing the character of the paleoenvironmental record, including whether it shows local, regional, or even worldwide patterns.

Geomorphological work in 2001 focused on coastal erosion and rivers. Several key spots along the coast were studied, including the spectacular slump north of Sevastopol proper and, thanks to Dr. Kluikin, the beach at Laspi, which revealed ca. 20m of debris flows and mudslides burying hearths and a “pier” (figure 3.41). Kluikin also kindly showed us the Kerch peninsula with its mud volcanoes (figure 3.38) and a key multicomponent alluvial site with stratified Cimmerian, Greco-Scythian, and early medieval layers.

Work on the rivers of western Crimea established terrace sequences and alluvial patterns in the Belbek and Kacha, resolving outstanding questions from past campaigns. This work also revealed how settlement patterns in the Crimean Mountains have affected river character and land cover over both decadal and millennial timescales. In the upper Kacha watershed, for example, forced relocation after WWII allowed vegetation to grow and soils to stabilize, leading to reduced sedimentation downstream. In the middle Belbek River, recent land clearance is associated with renewed high energy, destructive floods in contrast to apparent quiescence in the post-Byzantine period.

Fig. 241. Laspi mudslide and debris flow deposits exposed at beach. [PL]
Collection of data types obtained for the NASA-funded remote sensing project.

CORONA satellite photograph with vector overlay of Galina Nikolaenko’s reconstruction of the Chersonesan cadastras system of the 4th c BC. [J. TRELOGAN]
**PLATE IV**

Two photographs of a stele: left, visible-light; right, ultraviolet-light [R. POSAMENTIR]

Summer thunderstorm on a typical steppe landscape in Crimea. [P. LEHMAN]
More than 300 stelai, naiskoi, sarcophagi, and other grave monuments of the late 4th and 3rd century BC, with significant traces of painting and painted decorations, were found in archaeological excavations along the city walls of Chersonesos in the 1960s and 1970s. The objects were hastily and partially published—with low quality black and white images—soon afterwards by Russian scholars. Comparison material had not been used due to the difficult political circumstances. There was almost no attempt made to put the separate parts of the same monuments together. No attention was paid to questions concerning technique or color.

Beginning in 1994, new work on this outstanding material was begun by Professor Joseph C. Carter. The multidisciplinary, international effort includes extensive cataloging and detailed photographic documentation with Prof. Carter; Vitali Danielenko, (University of Simferopol), Chris Williams (ICA), and Richard Posamentir (the German Archaeological Institute, Athen). Prof. Paula Perlman (UT Department of Classics) undertook a restudy of the Greek inscriptions; scientific analysis of the pigment was provided by conservation scientist John Twilley; analysis of the architecture was done by Dr. Alla Buyskikh (Institute...
of Archaeology, Kyiv). Both Carter and Posamentir will evaluate the art historical importance of these monuments in a series of collaborative essays on the stelai, large-scale paintings, and limestone sarcophagi.

Scientific significance of the painted stelai of Chersonesos
The paint on the Hellenistic stelai (or gravestones) of Chersonesos—on reliefs, as well as on simple shafts—has survived remarkably well, in part because they were used as a filling material in a tower of the later city wall. The importance of this quantity of stelai simply cannot be overestimated for two reasons:

• One, they give, for the first time, an entire impression of a colorful antique necropolis with reliefs and painted gravestones standing next to each other. It is obvious from the inscribed or painted names that they belonged to certain homogeneous families and grave districts and were, judging from the tool marks, manufactured by specific workshops responsible for the work in a specific district.

From the bases to the tops, the stelai are complete in their painted decoration. Objects plastically (or sculpturally) rendered and covered with their final layer of paint were discovered next to stones with solely painted depictions showing the same objects. It should be possible to reconstruct, with their original appearance, entire grave districts of families living for at least three generations in the ancient city of Chersonesos.

• Two, and more importantly, the stelai of Chersonesos belonged to the periphery of the Greek world—a world which strongly tried to preserve the ideas and meanings behind shape, object, and depiction brought by Greeks to these outposts—while at the same time were influenced by local traditions. Interestingly, this contrast reveals insights into the structures of Greek burial customs in general, as rules concerning the shape of gravestones or meaning of specific objects were employed in an intensified and more rigorous way. Specific types of gravestones were reserved for men, women, or age groups. The same is true for the depiction of objects. Structural lines, which are less clear in the centers of the Greek world, emerge clearly at Chersonesos.

On the other hand, specific objects with deeper meaning in mainland Greece, such as types of vessels (the loutrophoros as a symbol for unmarried deceased, for example), are rejected completely and replaced by others. In fact, judging from the inscriptions which always give the husbands’ names, there seem to be no unmarried women in Chersonesos. A strong local aniconic tradition seems to be responsible for a remarkable minimization of figural depictions. This minimization goes hand in hand with the interesting reduction of well-known figural scenes to symbolic objects: the depiction of an Athenian citizen, an elderly bearded man typically leaning on a staff and wrapped in a mantle, is here replaced by a painted staff alone. The message transmitted to the visitor of the grave is, however, meant to be the same.

Despite the close imitation of Attic gravestones, local traditions surely must have been responsible for two striking features that can be observed on gravestones in the whole Black Sea area:

• First, a significant number of depictions emphasize the martial character of the owner by showing weapons; these objects are always plastically rendered and never simply painted. Furthermore, these are the largest stones among the stelai. Weapons on gravestones are rare in the Greek world before the 3rd century BC—but if they oc-

![Figure 2.43. A stele photographed with raking light. The distinctive tool marks indicate the work of a particular craftsman or workshop.](image)
cur, as on some pieces in Athens from the 5th century BC, they belong to people from the Black Sea area as revealed by the inscribed names.

- Second, one of the most characteristic features of Attic grave art, the public demonstration of affection between married couples, is missing completely: men and women have separate gravestones and are never depicted or honored on the same stele.

Still, the few figural depictions we have in Chersonesos are examples of well-developed craftsmanship belonging to the highest level of preserved paintings from Antiquity. Several pieces of naïskoi (shallow temple-like framing structures) with painted back walls are, as regards size and quality, simply without comparison among the Greek material currently known. Certainly the fact that Attic grave art was eliminated almost completely by Demetrios of Phaleron at the end of the 4th century BC hints at the migration of artists seeking employment in other areas of the Greek world, possibly Chersonesos. Exact studies will have to clarify these theories.

It is certainly no coincidence that in regard to shape, details, and objects depicted (ornaments or figures) the stelai from the Black Sea area are among the closest parallels to the Attic tombstones of the Classical period, which must be seen as prototypes of all gravestones of the Hellenistic world. Nowhere else, for example, can simple stones with painted taenia and attached alabastra or strigils be found but in Chersonesos. In no other place outside Athens have huge naïskoi with larger than life-sized painted figures on the back walls been found but in Chersonesos.

Furthermore, this material for the first time offers the chance to undertake a comprehensive study including questions concerning the techniques of painting and materials used. For this, we are thankful for the generous access granted to the team by the Ukrainian authorities.
Figure 2.45a. Stele of Megakles, son of Sannionos. (See Plate IV for Richard Posamentir’s photographs of this stele.) [cw]
In 1999 an effort was begun to identify the painting materials of the stelai (grave monuments) and architectural fragments from the early Hellenistic necropolis at the National Preserve of Tauric Chersonesos in Ukraine. At that time Jerry Podany (Conservator of Antiquities at the J. Paul Getty Museum, Los Angeles) and John Twilley (an independent conservation scientist based in New York with an adjunct appointment at the University of California) spent three days examining and sampling the painted limestone surfaces. Several dozen samples were collected, which have since been investigated in the laboratory by Twilley under a pilot project funded by the Getty Museum. A presentation of preliminary results was made in April 2000 at the conference entitled “Color in Ancient Greece,” hosted by Aristotle University of Thessalonica where Professor Joseph C. Carter of the University of Texas presented a parallel paper on the historical and archeological significance of the painted monuments. Twilley’s paper, “Pigment Analyses for the Grave Stelai and Architectural Fragments from Chersonesos,” is forthcoming in the symposium volume to be published by Aristotle University. Through the generosity of Professor John Parise of the State University of New York at Stony Brook, Twilley also performed experiments in the application of synchrotron X-ray diffraction to a subgroup of the samples at Brookhaven National Laboratory. This work has been described in an online abstract of the “National Synchrotron Light Source: Simultaneous Elemental and Microdiffraction Analysis of Ancient Greek Pigments from Chersonesos.” (http://www.pubs.bnl.gov/nsls00/pdf/twil3345.pdf)

Twilley and Podany’s initial examinations suggested that the more painterly designs employed a greater range of materials and techniques than the simple application of solid color accents that is more common to the grave stelai. Considerable lack of clarity, however, exists in these fragmentary remains of painting and more time and equipment was required to sample them with adequate thoroughness.

In July of 2001, funding was provided by the Institute of Classical Archaeology for Twilley to spend a week at Chersonesos undertaking more detailed examination and sampling, concentrating on points that would provide insight into not only the materials of the artisans, but also the methodologies with which they employed those materials. Twilley transported a stereo binocular microscope and infrared video camera to the site to assist in the sampling and documentation. There, he collaborated with Richard Posamentir who undertook ultraviolet fluorescence photography of the stelai at the same time. In the course of sampling it became clear that the more painterly compositions were char-
The function of the infrared video camera was to assist in visualizing parts of the painted compositions that are obscured due to soiling and deterioration by extending the range of human vision to an area of the spectrum where these impediments are reduced. The infrared results for the remarkable male portrait housed in the museum of the Preserve were particularly encouraging. Like many of the paintings discovered in the early 1960’s, this one is affected by the darkening of an acrylic consolidant applied to stabilize the paint layer soon after its discovery. While necessary for the physical protection of the painted surface, the coating has muted the contrast in the image over time. The portrait as it appears at a wavelength of one micron in the infrared is reproduced below from a composite of nine images (figure 2.46).

Compositional and stratigraphic samples of the paints from the portrait will be compared with those of the other fragmentary paintings in studies underway now. While the analyses of pigment usage on the stelae have to-date done much to clarify the inorganic materials used by the Greek artisans of Chersonesos and contributed to the clarification of indistinct markings, much remains to be done in other areas. Additional research will take place using cross-section microscopy, fluorescence microscopy, and analytical testing that proceeds on a layer-by-layer basis. Along with important art historical findings that will emerge from further research into these unique artifacts, valuable information that is essential to their future conservation and treatment will also result from this effort.
Since 1996, the Preserve and ICA, along with its affiliate CSAT, have carried out joint conservation campaigns for the unique ancient farm structures of Chersonesos with the goal of creating an archaeological park in the chora. This work has been possible, in large part, thanks to the generous financial support of the Packard Humanities Institute, the Samuel Kress Foundation, and the American Express Corporation, whose assistance has enabled us to keep teams of conservators in the field, in recent years, for as long as six months at a time (May–October). This year, because of the exceptionally fine weather, the work continued through November.

As the final problems in the conservation of the farmhouse at Site 151 were being resolved (see Vera Nikolaenko, p. 61), preparations were being made for conservation work on another site in the chora, the neighboring Site 132 (193) (figure 2.48). This farmhouse—together with Sites 151 (226), 133 (194), and 150 (227)—will form the core of the archaeological park at Ukharina Balka, the largest area of undisturbed ancient countryside on the Heraklean Peninsula. The farmhouse at Site 132 had been excavated in three campaigns (1988–1990) by an expedition from Moscow State University (MGU) under the direction of Prof. V. Kuzishchin. Unfortunately, the excavation was not completed. Politics intervened—Ukraine became an independent country—and the documentation of the excavation was never deposited in the Archives of the National Preserve.

These earlier excavations included no conservation measures, and the progressive disintegration of Site 132 was becoming obvious. The Preserve’s Deputy Director, Dr. Galina Nikolaenko, decided to intervene. In the spring of 2001 she initiated an extensive cleaning of the site, followed by an excavation campaign throughout the summer, aimed at preparing the site for thorough conservation. Areas of the site left partially or wholly unexcavated by the MGU team were excavated, and the whole site was fully documented. As far as possible, stratigraphy for the site was recovered, and an accurate site plan was produced.
Figure 2.49. Plan of Site 132.
All vegetation was removed; loose stones, left by the former excavators, were numbered and removed. Every room in the structure, with the exception of the circular tower (Room IX), was cleaned and excavated to bedrock. A previously unsuspected room (Room X) and the entrance to the farmhouse complex on the north were discovered. In a number of undisturbed areas, the stratigraphy could indeed be established. This resulted in a clarification of Kuzishchin’s broad dating for the site—from 4th century BC to the 3rd century AD—and a re-dimensioning of the Roman period. The preponderance of the pottery was Hellenistic Greek; clearly Roman material was scarce.

The ceramic materials recovered and studied include imported amphorae and roof tiles from Sinope—some bearing stamps with the names of the magistrates of that south Black Sea coastal city—locally produced Chersonesan amphorae also with stamps; fine black gloss pottery (fish plates, cups, and kantharoi); and Chersonesan red-striped pottery, jugs, louteria (for bathing), and cook pots and mortars used in food preparation.

In this brief survey that begins in the SW corner of Site 132 (figure 2.49), some of the principal features of the site will be noted. In Room I, the floor is paved with large flagstones (figure 2.50), like Room VIII in the tower and Room 1 in the tower of the neighboring farmhouse, Site 151. Room II was damaged by a WWII bomb that left a crater a meter in diameter. The room was filled with carefully trimmed, rusticated blocks of masonry that had apparently been reused from another structure. A “pool” (0.3 m deep and 3.5 m in diameter) was carved into the rock. It was connected by a drain to the tiny Room III (figure 2.51). The earth fill contained pottery of the 3rd–2nd century BC. Room IV, connected to Room II by a pass-sage with a threshold, contained more rusticated stones. (Kuzishchin noted mason’s marks on four of them, and fourteen additional marks were discovered in 2001.)

Room V, a long and narrow space, was, like Rooms I–III, certainly roofed, with an entrance on the north (1.9 m wide—also the width of the entrance to the entire complex.) This room was completely devoted to the production and storage of wine. There were nine pits excavated to receive pithoi (large terra cotta vessels, holding up to a thousand liters of wine) of different sizes (figure 2.52 and 2.53). One pit, the largest, and rectangular in shape, was probably for the counterweight of a wine press (figure 2.54). A square platform for a press was found in the NW corner of the room next to two interconnected pits that appear to have received the must (grape juice before and during the fermentation process), acting as settling tanks for the sediment (figure 2.55). Room VI was a corridor connecting courtyard B and Room IV.

Room VII, one of the two in the strongly reinforced tower, contained not only pits for pithoi but also the pithoi themselves (figure 2.58). The lower “cultural level” of Room VII had not been disturbed by the previous excavators. It contained many fragments of fine black gloss pottery and some Sinopean amphora fragments, which
may date as early as the second half of the 4th century BC. The foundation trench of the tower, chinked with stone, was also exposed.

In Room VIII Kuzishchin had excavated three layers of pavement. In the southern corner of the room there is the footing for stairs to the second story of the tower. A passage connected the paved room with that used as the wine cellar, in an arrangement identical to that found at a number of other sites, such as Site 151 (226). The walls of the tower were originally almost a meter thick, and they were reinforced on all four sides, probably about mid 3rd century BC, with an anti-battering ram buttress that is 1.2 m thick. Together, the walls of the tower are over 2 m thick at the base. The weakest point is on the south side of Room VIII, where the tower was entered. Room IX, the circular room or tower, has an interior diameter of 5.5 m. It had been excavated to bedrock in 1990; hence no evidence remained to date it. By analogy with similar round towers, it is probably one of the latest additions to the plan.

Room X: In this newly discovered room the complete stratigraphy of this part of the site, in four distinct levels over a meter deep in all, seems to have been preserved intact. In the lowest level there is good quality black gloss pottery, and it is sealed by a layer containing a coin of Chersonesos dated 320–310 BC. On this evidence the farm complex can be no later than the last quarter of the 4th century BC, and it may be somewhat earlier. Among the pottery is a fish plate with graffito ("Herakleidos") and a fragment of a kantharos dedicated, it would appear, to Dionysos (or possibly Zeus). The latest material from the site (which, as noted above, is not abundant) dates to the 2nd and 3rd centuries AD and comes from the pits along the northern edge of Courtyard B.

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Figure 2.52. Excavation of Room V

Figure 2.53. Room V after excavation, with circular cuttings for bedding pithoi.

Figure 2.54. Pl 11, Room V after excavation

Figure 2.55. Excavation of Pit 1a in Room V
Figure 2.56. Pits at the south end of courtyard A.

Figure 2.57. Restored portion of a black gloss fish plate, 3rd c BC. Diameter, 23.8 cm.

Figure 2.58. Room VII on the tower with pithos bases in situ.
The earliest levels of the farmhouse complex, in Room X, are of the same period as the earliest at Site 151, excavated by the joint Preserve-ICA team (1994–1996). The two buildings resemble each other in a number of respects, including the overall plan, though that may not seem immediately obvious. The earliest element here, as at Site 151, was surely the rectangular tower (oriented identically to the tower at Site 151). It likewise consisted of two interconnecting rooms: Room VIII, with its entrance and paved floor, is connected to the inner, more protected storage area, Room VII, by a similarly centered passage. Next in chronological order was surely the rectangular, almost square perimeter wall that encloses the whole complex except for Rooms I–III, and the circular tower, Room IX. Altogether, the structure covers a considerably larger area (770 m² compared to the 400 m² of Site 151).

The projecting block (Rooms I–III) seems to predate the anti-battering buttress of the tower, whereas the circular tower was, as G. Nikolaenko argues, almost certainly later. Room V of Site 132 also has a counterpart at Site 151, but after that the similarities are not so apparent.

Both farmhouses are similar in ways they differ from those in other areas of the chora. The more typical Chersonesian farmhouse or “country estate” has a powerful tower in one corner of its plan, not centered against a wall as at Site 132 and Site 151. Rooms typically line the perimeter walls, which is not the case in either site.

Though there may have been a shed roof along the northern wall of Courtyard B to protect the pits, Room X and Courtyards A and B (and very likely Rooms IV and VI) appear not to have been roofed. There are relatively few covered spaces at both Ukharina Balka sites. At Site 151 the entrance to the surrounding courtyards is at the south; here it is on the north, next to the tower, where it could be much more effectively defended from above. Room VI, as G. Nikolaenko suggests, is a corridor that leads to Room IV and the entrance to the tower on the south. It could be closed off at its narrow north end (like the probably-open Room 4 of Site 151 at its narrow west end). The approach to the entrance of the tower was much more effectively defended from the tower itself at 132 than at Site 151.

Nonetheless, both production-oriented residences seem to have followed the same historical trajectory, enjoying prosperity in the early Hellenistic period, enduring a major threat in the mid-3rd century, and suffering eventual abandonment, probably in the 2nd century BC, with a brief revival in the period of Roman occupation (2nd and 3rd centuries AD). Their architectural similarities suggest that this may have been a popular local pattern that, while sharing some features with farm buildings along the north coast (as at Lighthouse Point for example) does not seem to have been widely influential. Elsewhere, the plan with a central courtyard and corner tower prevailed.
Site 151
The 2001 campaign was the final year for preservation of Site 151 at Chersonesos. Site 151 presents three building periods from the second half of the 4th century BC to the late 2nd century BC. In restoring this site, this year we have improved the mortar that we used in 2000. Then, the mortar consisted of 10 measures of sand, 3 measures of lime paste, and 1 measure of cement. The composition of this mortar showed good results for endurance in our severe, northern Black Sea weather conditions, but we chose to improve it because of the need for a stronger and more plastic mortar that could be removed without damaging the structure being conserved. We decided on a mortar with the following composition: 9 measures of sand, 2 measure of lime paste, and 1.5 measures of cement. This solution produced excellent results. Very few cracks developed in hot (above 30º C) and dry (less than 50% humidity) weather. In warm or cool weather this mortar did not produce cracks at all. We also used this improved mortar for conservation in cold weather at temperatures ranging from 4º C to 10º C and obtained excellent results.

The final conservation work on Site 151 included creating a new foundation for the walls and strengthening the floor in the tower and the top edge of the walls with stones. Creation of a foundation for the walls was necessary for better drainage of rainwater and thawed snow, thus preventing moisture from accumulating at the base of the walls. To create a new foundation, we removed the earth under and around the wall to a depth of 10 cm along a 15 cm wide area, dried the newly exposed surfaces, then strengthened the earth with limewater, carefully spreading it with a brush. When this was dry, we strengthened it further by filling the trench with stones. The stones used for preservation had to be carefully cleaned of earth and moistened to insure proper bonding. Just as before, we moistened the surfaces with water and only then applied the mortar.

After all stones were stacked and fixed, we contoured the seams between stones with a damp or slightly wet brush. This gave the mortar additional durability and made the seam smoother. For more uniform drying of the mortar in warm weather, we covered the processed walls with wet or dry burlap. (In hot, dry weather, wet burlap was used; warm, humid weather called for a dry covering.) In cold weather no covering was necessary as the mortar dried slowly.

The process of staining the seams came next. The color of the stained seam had to harmonize with the general background color of the wall, as well as the entire structure. The stain consisted of 1 measure of mineral earth-color dye, 1 measure of cement, and 7 measures of dissolved limewater. When coloring seams, we moistened the surface of a seam with water and then put on the stain. It is best to spread it in warm, rather than hot, weather. When staining in very hot weather, the water evaporates too quickly and the color of the painted seams becomes too strong. In cold weather (approximately 5º C), the paint sticks poorly to the surface. This stain or dye, when dry, does not burn out in the sun or wash off with water. It actually has some water-resistant qualities. A short time after spreading it on the seams, it becomes dusty and acquires an even more natural color.

After the foundation of the walls was created, we undertook the strengthening of the walls’ top edges. This was absolutely necessary as the top, exposed to the elements, is the most vulnerable part of the wall. Much damage is also caused by people and animals, in particular the goats and cattle that local residents graze in the territory. We first cleared off the dirt, then moistened the cement surface, which had been completed in the summer of 2000. Then we applied the improved cement mortar to the moistened surface. After that, we put small wet stones on the mortar and carefully closed up the seams between the stones, which were stacked so that water could flow freely down the wall surface. After a final staining, the process was complete.

Figure 2.60. The conservation team working at site 151.
Site 132

Site 132 was a wine-production and living complex which appeared in the second half of the 4th century BC and survived well into the Roman period. The last excavations on this site were conducted in 1991, so, as mentioned above, we first had to clear vegetation, slagheaps, and earth from the walls, rooms, and stone blocks. During the clearing, we found cisterns. The bottoms of the cisterns were lined with strong fabric to protect them when they were back-filled at the end of the season. (The cisterns can later be cleared of earth if necessary.) The process of conserving this site included the typical clearing of surface dirt from the seams, strengthening the remaining dirt in the seams, applying the mortar, and staining.

We strengthened only the lateral surfaces of walls at Site 132 in 2001. This was done in order to prevent the destruction of the wall during the future strengthening of its top edge. Since unconserved and unprotected walls have been crumbling and falling regularly on this site for the last 10 years, it was deemed advisable to strengthen them as soon as possible. The depth of the cleared seams had to measure 7–10 cm where possible in order to strengthen the wall enough with mortar so that the stones of the walls would not fall during future conservation campaigns. Our general conservation technique was the same as that described for Site 151. Where it was possible and where water had accumulated at the base of the walls, we also deepened the foundations, sloping them so that the rain and thawed snow would not destroy them.

Room 2 had suffered rather badly. Parts of the wall consisted of large blocks that were ready to fall at any moment. For this reason, during the 2001 conservation campaign we conserved the destroyed parts of this structure. Courtyard A and rooms II, III, IV and V on Site 132 were partially conserved. Our goal for 2002 is to finish the preservation of all the rooms at this site.

Translation by Nikita Khrapunov and Masha Shatalina

Figure 2.61. Vera Nikolaenko (foreground) and assistant work to secure a wall’s surface at Site 151.
Computerization Overview
While 2000 might be described as the year of technology introduction for Chersonesos, 2001 most certainly is the year of implementation. Solidifying the technical infrastructure at the Museum last year has reaped substantial dividends in increased communication and tangible research results. This corresponds to our primary communications goal: coordination of summer fieldwork with long-term technological development of the Preserve.

Web site overview
The primary focus of the communication work in 2001 was completion of the official Preserve web site, chersonesos.org. Ludmila (Lucy) Grinenko, Head Librarian at the Preserve, is the main editor of the web site and coordinator of contributions by the Museum staff. Oleg Vertolitsky designed and currently maintains the site. Chersonesos.org was officially published in Russian on December 15, 2001. The web site continues to expand, and the Preserve’s research will reach a wider audience as the site is translated into other languages. Svetlana Telenkova is overseeing the Ukrainian translation from Kyiv (in addition to her duties as the ICA’s Kyiv coordinator). Nikita Khrapunov is managing the web site’s English version from Simferopol.

Guidebook Overview
In 2002, ICA will publish an English-language reference book on the history of Chersonesos and its excavations. Crimean Chersonesos evolved from an earlier guidebook idea into a scholarly 168-page illustrated history, including walking itinerary, maps, and descriptions of Preserve areas and principal monuments. With over three dozen contributors and collaborators worldwide, this production will also serve as part of the “statement of significance” necessary for application to UNESCO’s World Cultural Heritage List.

Figure 2.62. Left: Nonna Krasovskaya, Head Archivist, scans a century-old glass negative from the archives. (Standing: ICA’s Roman Sazonov). [cw]. Right: Lucy Grinenko, Head Librarian, with color plates from the collection. [cw]
Communication Strategy
Phase I of ICA’s communication strategy was to add or improve computer equipment, telephony, and Internet access for the Museum. Having accomplished that by the end of 2000, ICA moved to Phase II: Preserve staff computer training and the development of chersonesos.org web site. This year Lucy Grinenko made the training and web site a reality. The addition of Taissa Bushnell as ICA representative has improved communications and goodwill immeasurably. Phase III will seek to digitize the Preserve’s library, archives, and fondi collections, create Web-based research databases, and maintain a museum web site in three languages to serve both public and scientific interests. In a country where less than two percent of the population has a computer or Internet access, the current technological situation at the Museum is pioneering.

2001 Summer Fieldwork Stations
In support of ICA excavation and research projects, we established several workstations throughout the Preserve during the summer season. Computer equipment and peripherals (with Internet access for three of the five stations) were set up for excavation data, the Preserve architectural master plan, guidebook research, administration and translation, and image digitization. At the end of the season, these computers were relocated to the archives, fondi, medieval ceramic collection, illustrations department, and the library reading room for general staff use.

Internet access and Museum network
The Preserve was finally able to free itself from reliance on 50-year old copper wire technology for Internet access. In early 2001, with ICA’s support, the Preserve installed radio-ethernet for a direct Internet connection at speeds up to 64 KB/sec. This action more than doubled previous download speeds and connected all the Preserve computers to the Internet via a network. Oleg Vertolitsky’s technical expertise as system administrator has eased the difficulties of operating in a challenging environment.

Computer Training
In the spring of 2001, Lucy Grinenko organized forty-two Preserve staff members to complete basic computer courses taught by a Sevastopol company, Metronom. Only 10 staff members had the requisite knowledge to test-out of the elementary course. By the end of the year, 56 colleagues completed additional courses in word processing and spreadsheets. 25 more are pursuing studies in database and graphics applications. Another 30 have had personal training sessions with Mr. Vertolitsky to use e-mail and Internet searches. Special classes in digital photography, scanning, web maintenance, and accounting have been conducted for smaller advanced groups. Access to equipment, information, and training has not only increased the skills of the staff, it has had the satisfying effect of renewing scientific activity, improving the general mood at the Museum, and increasing mutual interest in each other’s research.
**Equipment acquisition**
ICA made significant contributions to the productivity of the library and research scientists by donating a copy machine, binding machine, scanners, CD writers, and a digital camera for use by the staff. In addition to a generator from the previous year, ICA added uninterrupted power supplies to protect all computer equipment and data during frequent power outages. ICA also provided cellular telephones for summer field coordination. Furthermore, the Ukrainian Ministry of Arts and Culture resumed funding for Museum equipment and the Preserve requested an additional six computers, laser printer, and copy machine. The Ministry promised continued annual support.

**Cataloging library and archives**
Lucy Grinenko is working to include the more than 30,000 items in the Preserve catalog as part of a nationwide electronic library system already in place in Ukraine. With software developed by the European Union and TACIS, Chersonesos would join about a dozen other libraries that have their complete holdings available through an on-line database. Lucy and Oleg have written the Megarika project, a proposal for a full-scale integrated database system for Preserve materials in the library, archives, and fondi. A representative from a Moscow archival digitizing firm, Pro-Soft, visited this year and assisted in estimates for a budget and timeline for the completion of the Megarika digitization project.

**Recording and digitizing library and archives**
ICA conducted intensive research and trained the staff in digital imaging in the Preserve library and archives during the 2001 summer season. The Preserve has tens of thousands of pictures, maps, letters, drawings, illustrations, articles, and research material from over 150 years of research. These materials are subject to decay and eventual loss. Most of the imaging work this summer was done on a flat bed scanner with a slide/negative adapter. Images were recorded on a CD burner and stored for use by researchers instead of handling the rare originals. Digitizing over 500 glass-plate negatives, maps, and excavation plans in 2001 had dual outcomes. First, ICA acquired priceless images for publication in Crimean Chersonesos. Secondly, together with the archive staff, we began the process of recording some of the most valuable and perishable materials in the archives. It is hoped this material will be available to researchers and colleagues around the world in the near future via chersonesos.org. (See page 66 for two examples of images from this project.)

**Conclusion**
The highlights of 2001 are the success of staff computer training and the publication of the Russian version of chersonesos.org. We have overcome many technological gaps and obstacles. We have created, through technology, ongoing dialog and feedback between ICA and the Preserve, essential for our joint projects. The mood is positive, and the pending publication of Crimean Chersonesos will be another tangible result of cooperation on a wide scale. The Museum is quickly becoming better able logistically to handle larger projects, such as an archaeological park and international field school.
Two late-19th century photographs from the Preserve archives. Above, an artifact storage area outside the antiquities warehouse. Below, an early Museum exhibition room. The original glass-plate negatives were scanned, then processed in Adobe Photoshop.
In March 2001 I began working at the National Preserve of Tauric Chersonesos as a representative of ICA. My primary responsibility as ICA’s on-site liaison is to oversee throughout the year the various joint projects initiated by ICA and the Preserve during the excavation season and to enhance the two-way communication between both institutions so that work on the projects can proceed quickly and efficiently. Primary among these projects have been:

- Overseeing the ongoing improvement of communications for Chersonesos as outlined and initiated by Glenn Mack: maintenance of Internet access, computer training of museum staff, installation of telephone lines to ICA summer workplaces, creation of a computer network, development of a Chersonesos website, digitization for the library and archives.
- Coordinating contributions from the Chersonesos staff for the historical guide being produced in Austin.
- Continuing diplomatic and outreach efforts, especially within Ukraine, to assure local political and financial support for Chersonesos.

My responsibilities broadened with the arrival of the summer teams and the start of the excavation season. I supervised the pottery and finds laboratory, translated excavation context sheets into Russian, and assisted Asele Surina, ICA Program Coordinator, with logistics for the excavation team.

Figure 2.65. ICA staff members Asele Surina (left) and Taïssa Bushnell (third from left) in a meeting with the mayor of Sevastopol, Leonid Zhunko (second from left) and the assistant to the mayor, Mikhail Yourlov (right).
“Support for Chersonesos”

In July 2001 Professor Joseph Carter created and registered in Sevastopol a nonprofit organization, *Pidtrymka Chersonesu* (PC)—translated as “Support for Chersonesos”—in order to insure ICA’s compliance with Ukrainian legal and fiscal systems. As a PC board member residing in Sevastopol, I direct the nonprofit’s daily activities. The ultimate mission of the organization is the protection and preservation of cultural heritage located within the National Preserve through the preservation of historical and cultural monuments and the development of scientific research. Outlined below are the areas and programs that ICA supports through PC:

- Archaeological excavations within the ancient city and chora of the National Preserve.
- Technical assistance in the form of the purchase and maintenance of computer and telecommunications equipment.
- Scientific research and publication.
- Renovation and construction of scientific laboratories and storage facilities for archaeological finds.
- Purchase and maintenance of equipment for conservation and restoration of archaeological finds and structures.
- Consultation with invited specialists on archaeological conservation and preservation of cultural heritage.
- Helping secure grants and equipment for specialist consultation and individual research work.
- Support for the creation of an archaeological park.
- Assistance with outreach and publicizing the Preserve; contacts with international organizations.
- Local fund raising and further development of the nonprofit organization.

**Outreach**

The cold war and the status of Sevastopol as a closed city largely blocked, for many decades, the access of information and the exchange of scholars between the West and Chersonesos. This has caused two phenomena: the relative obscurity of Chersonesos in the eyes of countries beyond the former Soviet Union and, conversely, the Preserve’s limited exposure to western developments in, for example, artifact and monument conservation and the uses of computer technology in museum libraries and archives. The troubled Ukrainian economy has not helped matters. ICA’s research and publicity have been important in informing western scholars about Chersonesos. To help publicize the importance of Chersonesos in the Ukrainian-American community I wrote an article in the Ukrainian Weekly, an English-language newspaper published in the US, about the inclusion of Chersonesos on the 2002 World Monuments Watch List of 100 Most Endangered Sites. The creation of *Pidtrymka Chersonesu* was announced in an article in the Sevastopol daily, Slačva Sevastopolya. In addition, I represented Chersonesos at the October press conference of the World Monuments Fund in New York at which the 2002 Watch List was announced.

Beside conducting and publicizing research, another goal of ICA is the continued development of Chersonesos into an archaeological park and regional research center. With this in mind, I have continued Professor Carter’s mission to gain support for our plans by meeting with Leonid Zhunko, the Mayor of Sevastopol, on several occasions; Leonid Novokhatko, the Vice Minister of Culture of Ukraine; and Evnika Linyova, the Head of Cultural Preservation at the Ministry of Culture this past summer. Professor Carter and I had the opportunity to present a preliminary version of the first volume of the master plan for developing the Preserve into an archaeological park—which I had abridged and translated into Ukrainian—to the former Prime Minister of Ukraine, Viktor Yushchenko, when he visited Chersonesos in July. Copies of this booklet were also presented to President Kuchma, Yuri Bohutsky, Minister of Culture, Mr. Zhunko, and Ms. Linyova.

![Figure 2.66. U.S. Ambassador to Ukraine Carlos Pascual (second from right) visited Chersonesos in August, 2001. Joining him were (L to R) Nikolai Andrushchenko, Tatiana Bazhanova, Larissa Sedikova, Galina Nikolaenko, Taissa Bushnell, and Leonid Marchenko.](image-url)
U.S. Ambassador Carlos Pascual visited Chersonesos in August 2001, toured the archaeological monuments and exhibit halls, and was informed about the ten-year history of ICA's work at Chersonesos and the various joint projects that ICA and the Preserve have initiated. My subsequent meetings with Mark Taplin and Marta Pereyma of the Cultural Affairs section at the U.S. embassy in Kyiv produced useful information about embassy programs for university exchange opportunities that will enhance ICA's close cooperation with universities in Ukraine that train students in archaeology. These higher institutions include the National Shevchenko University, the Kyiv Mohyla Academy, the Archaeological Institute of the Ukrainian National Academy of Sciences, and Simferopol University.

As one of the few English-Ukrainian speakers at Chersonesos I was contacted on several occasions to provide informational tours to visitors from afar, among them a delegation of the American Union of Ukrainian Women and the head of the Organization of Ukrainian Nationalists, Mykola Plawiuk. All of these outreach efforts have been intended to publicize the importance of Chersonesos as a uniquely valuable archaeological preserve and to gain support for its further development.

Information Sharing
Continuing efforts are being made to reverse the effects of the Preserve’s limited exposure to new developments in areas such as conservation and computer technology. This year I oversaw computer training of the museum staff and gave English lessons to some members of the staff to ease communication between the staff and the ICA summer team, as well as to improve their chances of obtaining grants for internships and training abroad. I assisted staff members with several grant applications. Participation at international conferences by members of the Chersonesos staff this year has also helped them learn of innovations in their related fields and has promoted an exchange of information. Lucy Grinenko, head librarian at Chersonesos, attended a library sciences conference in Sudak, Crimea, thanks to the support of ICA. With similar financial and logistical support from ICA, Larissa Sedikova, co-field director of the 2001 ICA-Chersonesos excavation, attended the 2002 Archaeological Institute of America annual meeting in Philadelphia where she gave a paper on the joint excavation. ICA will help fund the participation of a delegation from Chersonesos at a conference in Odessa in April 2002 entitled “Archaeology and Ethnology of Eastern Europe: Youth Approaching the 21st Century.”

Conclusion
Effective year-long collaboration between ICA and the Preserve is crucial if the joint projects outlined above are to make rapid and productive strides forward. The presence at Chersonesos of a fulltime ICA representative has been beneficial in this regard, and, from conversations I’ve had with the staff at Chersonesos, it is evident that the people of the Preserve perceive ICA as a permanent, helpful, and active member of the Chersonesos research community.
Artist’s concept of the ancient Greek city of Chersonesos port area. From the Archive collection.
Plan of 1904 excavations in the port area, southeastern region of Chersonesos ancient city, by M.N. Skubtsov. From the NPTC archives
Map showing areas covered by the 2001 Metaponto survey season. The geomorphological zones shown in this figure were digitized by ICA staff this year from a map created by James Abbott (U.T. Geography). The map is shaded to show relief using a digital elevation model from an interferometric pair of synthetic aperture radar scenes, by Larry Teng and Amy Neuenschwander of U.T.'s Center for Space
Analysis, Research, and Publication Efforts
Work towards final publication of the results of the archaeological survey carried out by ICA between 1981 and 1984 (under the direction of Cesare D’Annibale) made considerable progress this year. Early in 2001, a team of Italian researchers was assembled to complete and update analysis and documentation of the large inventory of ceramic artifacts collected by the survey. Artifacts of the Greek period are now being studied by Dr. Vincenzo Cracolici, while Roman and post-Roman materials are the responsibility of Dr. Erminia Lapadula. Cesare Raho, Eloisa Vittoria, and Giambattista Sassi, all of whom have been working in close collaboration with Cracolici and Lapadula, are creating visual documentation of the survey artifacts in the form of scaled line drawings and digital photographs. In December 2001, Dr. Rebecca Miller Ammerman agreed to join Mary Malone in the study of the approximately 350 fragments of Greek terra cotta figurines and nearly 60 fragments of Greek architectural terra cottas collected by the survey project. Dr. Ammerman and Ms. Malone will travel to Metaponto in January 2002 to conduct a preliminary study of these artifacts and to develop a strategy for their complete analysis and documentation.

By the end of October 2001, Cracolici and Lapadula had completed a full classification and inventory of the nearly 51,000 artifacts collected by the survey between 1981 and 2,000. Roughly 75% of this material (37,515 artifacts) was collected during the 1981–1984 survey campaign that is the focus of our immediate publication efforts. In addition, Lapadula completed a detailed inventory of more than 2000 of the most significant Roman and post-Roman finds made by the survey. Cracolici’s initial inventory of the massive Greek assemblages (nearly 44,000 artifacts from all years) provides broad dating for the more than 530 collections made in the early 1980s at sites with Greek occupational components. Currently, Dr. Cracolici is working on a more detailed analysis of Greek fine wares collected at a series of 228 sites recorded during the early 1980s, to be completed by April 2002, that will provide more refined chronological information.

Figure 3.1. The survey team mapping a site in the chora of Metaponto, July 2001.
Compared to other Mediterranean surveys, the collections from Metaponto are enormous, in terms of both the numbers of sites recorded and of artifacts collected. That artifacts of the Greek period should comprise more than 80% of all artifacts collected during survey is also extremely unusual and reflects not only the remarkable density of rural Greek settlement in this region but also the extremely high degree of preservation of this ancient rural landscape. Although the work of artifact analysis and documentation is not yet complete for the Metaponto survey, great strides were made in 2001. Both Cracolici and Lapadula are currently preparing manuscripts concerning, respectively, the Greek and Roman/post-Roman ceramic assemblages that will be incorporated as chapters in the survey volume. Their contributions to the publication should be complete by March 2002.

Preparation of other sections of the survey volume is also well underway. Dr. James Abbott has submitted the final draft of his chapter on the geomorphological history of the Metapontino, and the copy editing and page layout have been completed. Editing and updating of a manuscript dealing with the physical geology of the region, prepared in 1981 by Prof. Robert Folk (UT Geology), is also underway. Other writing projects associated with the survey volume that are nearing completion include a chapter describing and evaluating the survey methods used during the 1980s campaign (Thompson), a chapter devoted to the prehistoric settlement of the region (Thompson and Dr. Gianna Ayala), and a chapter that provides discussion and detailed analysis of rural sites during the Greek period (Thompson).

Archaeological Field Survey in 2001
ICA continued its long-standing program of archaeological survey in the chora of Metaponto with a seven-week field season from June 25 to August 10, 2001. The survey field crew, under the direction of Stephen Thompson, was comprised of University of Texas undergraduates (Kelley Russell, Caitlin McCracken, Heather Harper), UT graduate student Albert Prieto (assistant field director), and graduate students from the University of Cincinnati (Mark Armstrong) and Florida State University (Kelly Williams, Kelly Gilbride). Rosetta Torraco, as in years past, provided invaluable assistance in numerous logistical matters. She made an especially great effort in securing accommodations and transportation for Dr. Roberto Gutierrez of the Bureau of Economic Geology at the University of Texas during his visit to Metaponto in late July as part of ICA's proposed collaborative project of LIDAR (airborne laser mapping—see below). ICA’s newly acquired and renovated facilities at Pantanello provided lodging for five of this season’s crewmembers as well as daily workspace for the survey members and our Italian collaborators.

The fieldwork at Metaponto focused on two main objectives: first, to complete the program of resurvey (begun last season) of selected areas between the Bradano and Basento Rivers, originally covered by ICA crews in the early 1980s, and second, to resume surveying (begun in 1992–1994) in the Basento-Cavone transect in the southern half of the Metapontine chora.
The field methods used by the survey this season follow closely those presented in detail in the 1999 and 2000 Annual Reports. Basic aspects of the survey methods include 10-meter-interval coverage, recording of land use and surface visibility conditions for each walked field, and density mapping of surface artifacts at all potential sites. As in 2000, mapping of the boundaries of surveyed fields and sites was carried out with a recently-acquired GPS receiver operating with a real-time differential correction subscription. With the computing resources now available at Pantanello, a daily data entry session following fieldwork allowed us to update our Geographic Information Systems and tabular databases in a timely fashion and provide additional valuable training and experience for the field crew members. Preliminary plans to develop ICA's ongoing survey work at Metaponto into a formal archaeological field school offering detailed training in survey methodology, artifact analysis, data management, and mapping technologies were discussed with various potential participants during the field season.

Extremely dry weather throughout eastern Basilicata this summer resulted in many fields not being plowed due to the hardness of the soil. As a consequence, the field crew was forced to ‘hopscotch’ around the territory in an almost daily search for terrain not wholly obscured by vegetation. In addition to slowing work and lowering the normal rate of coverage (by roughly 25%) for the survey, the objectives of the program of resurvey suffered especially because of the inaccessibility of certain areas specifically targeted for restudy. Despite this obstacle, it was a successful season. In all, 2.92 km2 of terrain were intensively surveyed this season (figure 3.3), of which roughly one-third consisted of resurveyed land between the Bradano and Basento Rivers and two-thirds of new terrain between the Basento and Cavone Rivers. A total of 67 sites were identified, mapped, and collected, including 28 revisited sites in the Bradano–Basento transect and 31 new sites in the Basento–Cavone transect. An additional 8 new sites were identified between the Bradano and Basento Rivers, including 4 sites in previously surveyed areas and 4 sites in newly surveyed areas.

**Resurvey**

In order to gain familiarity with the zone surveyed by ICA in the early 1980s, and to evaluate the results of that work using more detailed field methods, resurvey of selected portions of the Metapontino was begun last season (see the 2000 Annual Report). Initially, the primary objective of the resurvey program was to assess the accuracy of the locations and sizes of sites and the densities and diversity of surface artifacts reported in the original records of the 1980s survey. The 2000 resurvey also unexpectedly highlighted a series of discrepancies between the results of the original and resurvey campaigns. While certain of the differences between the surface records documented during the early 1980s and in 2000 can be attributed to differences in field methods and the availability of new technology (GPS, for example, has much improved the precision of field mapping), much of the disparity between what was seen twenty years ago and what was discovered during last summer's resurvey cannot be accounted for so readily.

In fact, what last season's resurvey efforts brought home most clearly was the pronounced destructive effect of certain agricultural practices upon the surface archaeological record over the past twenty years. Because of the long history of surface survey at Metaponto, we realized that we have a unique opportunity to study systematically the specific effects of modern agriculture upon the structure of the surface record. Consequently, this year's resurvey program was guided by an amended set of objectives:

- to assess further the accuracy of site locations and sizes recorded during the original 1980s survey campaign,
- to evaluate the representativeness of distributional information collected during the 1980s for rare artifact classes, especially prehistoric artifacts, through the introduction of an off-site or continuous artifact collection strategy
- to assess the nature and rate of changes to the surface artifact record of the region over the past twenty years.

During the first season of resurvey in 2000, 1.30 km2 of land in the Lago del Lupo locale and 0.29 km2 in the Agnone di S.Angelo locale first surveyed in the early 1980s were subjected to resurvey (see 2000 Annual Report). This season, an additional 0.95 km2 of terrain was resurveyed in the Giardinetto, Demanio Campagnolo, Masseria Avinella, and Masseria Scarciullo-Giamperduto locales (figure 3.3). Together in 2000 and 2001, we have now resurveyed some 2.5 square kilometers, or roughly 10% of the total area originally covered in the early 1980s. What we are finding—or rather, not finding—is interesting.

According to the records of the original survey, there should have been 81 sites within the area we have now subjected to intensive resurvey. The resurvey program, however, has been unable to relocate 21, or roughly one-quarter, of these sites. Almost without exception, the sites that we have been unable to rediscover during resurvey were described in the original records as having relatively small overall areas and relatively low artifact densities (figure 3.4). According to some studies, relatively ephemeral plow zone sites with artifact densities below a certain critical threshold will appear to ‘turn off and on’ with each new plowing. So, did we ‘lose’ these sites or, more accurately, fail to recognize them because of stochastic plow zone processes beyond our control? While this may account for some of the loss, it cannot account for all because by the same logic we should have found during
resurvey 20 or so new sites not recognized during the early 1980s for precisely the same reasons. However, our resurvey has recorded only 3 new sites not seen twenty years ago. A more parsimonious explanation for the ‘lost’ sites is that they have truly disappeared or, at least, have become so dispersed within the plow zone as to be no longer recognizable by bounded concentrations of surface artifacts. The deep plowing common to the region would appear to be the agent most directly responsible for this disappearance.

Although we do not have continuous information about land use over the whole of the area surveyed 20 years ago (the survey in the early 1980s recorded land use only where sites were identified), that which we do have indicates that the modern agricultural landscape is highly dynamic. Not only has the variety of crops grown in the Metapontino increased, but also what crops are grown where changes quite rapidly and frequently. Exploring the relationship between local land use changes over the past 20 years and the locations of our “lost” sites, the first thing to note is that at 84% of all sites, whether rediscovered or not, the specific crops in these locations are different from what they were 20 years ago (see table, below). A second thing to note is that roughly 80% of all “lost” sites are associated with areas where grapes either were or now are grown and that the proportion of lost sites in vineyards is more than twice as high as we would expect were there no relationship between the two.

Over the course of the past two seasons, we have also collected information on the various techniques of soil preparation and field maintenance practiced in the Metapontino and have discovered that there exists a remarkable variation by crop. Significantly, initial preparation of fields for grape growing entails working the soil to depths of more than a meter to break it up for the deeply rooted vines.

Twenty years ago when survey began in the Metapontino, the introduction of mechanized deep-plowing was clearly recognized as the agent responsible for bringing the surface archaeological record so dramatically into view. From our current vantage point, it now is quite apparent that continued application of these techniques is also increasingly responsible for progressively removing much of the record from our view. While this probably comes as no surprise, the rate of site loss documented by our resurvey work—roughly 1% per year—seems remarkably high. And though it may be the case that thus far it is largely the more ephemeral sites that have suffered most from modern agricultural practices, we expect that with time the more obvious, robust sites of the region too will be increasingly affected. During the 2001 field season, for example, one of the largest and densest sites (Site 401, a necropolis covering approximately 0.75 km$^2$ in the Demanio Campagnolo locale) in the inventory of 560 sites identified by the early 1980s campaign could not be convincingly relocated during the 2001 resurvey. Once again, an extensive vineyard now covers the land occupied by
Site 401, which was devoted to grain cultivation in 1982. Finally, our resurvey work at Metaponto strongly cautions that syntheses of Mediterranean survey projects need to be more sensitive to regional variations in contemporary land use practices and the cumulative effects of past practices because they profoundly affect the visible archaeological record.

In terms of the increasingly important inter-regional agenda, making the surface records of different regions comparable is not simply a matter of ‘correcting’ data according to differing methods of regional survey, but also of developing a more refined understandings of how the very object of our analyses is changing through time. In order to help us more fully achieve these goals, we anticipate additional resurvey programs during future field seasons at Metaponto.

**New Survey**

In addition to resurvey, fieldwork this season at Metaponto also entailed intensive survey of an additional 1.81 km² of previously unexplored land between the Basento and Cavone Rivers. Coverage was concentrated in two primary zones: in the vicinity of Masseria Incoronata/Masseria Cugnarelli and in the Feroleto/Lama San Nicola localities (figure 3.5). This new survey work in

![Figure 3.4](image)

**Figure 3.4.** Relative artifact densities (top) and sizes (bottom) of sites lost and rediscovered during the 2000 and 2001 resurvey seasons.
the Basento-Cavone transect identified a total of 31 new sites. Although study of the artifacts collected this season is not yet complete, preliminary analysis indicates that at least 25 of these sites were occupied during the Greek period, including a relatively large necropolis site identified by the presence of human bone in two locations (Site 795), a number of large domestic sites (e.g. Sites 794, 807, 816, 818, 819, 827), and a kiln site in the Fosso del Lavandaio valley (Site 829). Ceramics of the Roman Republican period have not yet been identified among any of the new sites documented this season, but imported African red-slipped pottery of the Imperial period was found at four sites (Sites 794, 795, 811, 812) in two localities: near the Vaccheria di San Basilio and on a high Pleistocene alluvial terrace along the northern side of the Cavone valley. Prehistoric artifacts, including lithics and handmade pottery, were collected in limited numbers from 12 sites and 10 off-site contexts. As is now clearly apparent north of the Basento River as well as from the survey results south of the Basento during the early 1990s, the distribution of prehistoric artifacts is strongly associated with the margins of the major river valleys and their tributaries.

**LIDAR Topographic Mapping**

Plans to carry out a program of extremely detailed topographic mapping over a 20 x 20 kilometer area of the Metapontino using an airborne laser altimetry system, in collaboration with The University of Texas’ Bureau of Economic Geology and Center for Space Research, were

![Figure 3.5. New (2001) and existing areas surveyed in the Basento-Cavone transect.](image)
## Land Use Change & Effect on Site Visibility—Early 1980s to 2000–2001

<table>
<thead>
<tr>
<th>Change in Land Use</th>
<th>Rediscovered Sites</th>
<th>“Lost” Sites</th>
<th>% of all “Lost” Sites</th>
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<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
<td>#</td>
</tr>
<tr>
<td>Vineyard → Vineyard</td>
<td>0</td>
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<td>Vineyard → Fruit Trees</td>
<td>7</td>
<td>47%</td>
<td>8</td>
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<td>Vineyard → Plowed</td>
<td>0</td>
<td>0%</td>
<td>2</td>
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<tr>
<td>Vineyard → Market Vegetables</td>
<td>1</td>
<td>50%</td>
<td>1</td>
</tr>
<tr>
<td>Vineyard → Citrus</td>
<td>1</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Vineyard → Grain</td>
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<td>100%</td>
<td>0</td>
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<td>48%</td>
<td>11</td>
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<tr>
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<td>0</td>
</tr>
<tr>
<td>Nut Trees → Vineyard</td>
<td>1</td>
<td>100%</td>
<td>0</td>
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<td>64%</td>
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<td>1</td>
<td>33%</td>
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<td>75%</td>
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<td>Plowed → Uncultivated</td>
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<td>67%</td>
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<td>100%</td>
<td>0</td>
</tr>
<tr>
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<td>4</td>
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<td>0</td>
</tr>
<tr>
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<td>3</td>
<td>100%</td>
<td>0</td>
</tr>
<tr>
<td>Grain → Citrus</td>
<td>2</td>
<td>100%</td>
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further developed this year. The basic aim of this project, for which research began in the fall of 1999, is to produce a highly detailed and closely geo-referenced digital elevation model (DEM) of the region that would serve a range of research goals. In the first instance, the DEM would be used as a means of detecting extant topographic signatures of the system of Greek division lines long known in the region (see 1999 Annual Report). The DEM, however, would also allow for the extremely accurate registration of historical aerial photographs as well as a range of other remotely sensed imagery that may provide indications of the configuration of the ancient land division system. Detailed hydrological analysis of the DEM in conjunction with study of the division line system may help to determine whether these ancient landscape features were, at least in part, designed to solve natural drainage difficulties in the region. Finally, the LIDAR-generated DEM may prove useful, particularly if integrated with a systematic program of coring, for the reconstruction of earlier coastal landscapes in the region that, in turn, should bolster the interpretation of long-term regional settlement patterns as determined through archaeological survey and excavation.

Following the preparation of a detailed research proposal in the first half of 2001, Dr. Roberto Gutierrez of UT’s Bureau of Economic Geology joined the Metaponto field crew briefly in late July to gather additional information necessary for the further organization, planning, and funding of the LIDAR project. Although the Metaponto LIDAR project still needs to resolve logistical, bureaucratic, and funding issues, the project made important advances this year.
The Ceramic Project group of ICA has been preparing the definitive study of the pottery found from 1974 to 1993 at the Pantanello Sanctuary in Metaponto, Italy. We spent the last year 1) entering the remainder of the ceramic data in the databases, which is now complete; 2) continuing the process of editing the data for statistical analysis; and 3) scanning, cleaning, and digitizing the drawings of ceramic pieces to make them ready for selection and publication. Much of this work was performed by University of Texas students Ting Ting Wu, Thomas Howe, Rosalyn Mandola, and Jacqueline Polvora, whose efforts and commitment to the project have been invaluable. We now have a database of some 25,000 records, each with 51 potential entries. Ms. Wu will, in 2002, focus particularly on the statistical analysis of the ceramic database. James Collins, a former UT assistant in the project, provided valuable training for several of the students in the use of Photoshop software. During an intensive summer session Bronwen Wickkiser, Melinda Spearman, Hilary Meyrick-Long, and I searched for comparisons from other sites to help place the finds from the Pantanello Sanctuary in a broader archaeological context. It is only fair to acknowledge the efforts of these students; while their work is not glamorous, it is essential to the project’s success.

Production practices, economic transactions, and pottery’s voice in history
During 2001 I also pursued three main lines of research. The first was creating a timeline of political and economic events to supply information about the shifting spheres of influence that may have affected the power structures in Metaponto, as well as the production and acquisition of goods, particularly ceramics, from the 6th through the late 3rd centuries BC. Pottery, like other items of archaeological material culture, is the result of production practices, trading routes, migration, and economic transactions that reflect not only supply and demand, but also political events. Metaponto did not exist in a vacuum: its foundation, development, apogee,
and possibly lackluster last years reflect events that took place and affected the whole of southern Italy and Sicily. Archaeological remains, including pottery, can provide clues to the political and economic fortunes of an entire area and challenge or corroborate the evidence obtained from historical sources.

Second, I examined historical evidence for the roles played by sanctuaries and other cultic areas in the political and economic life of the communities they served. Lastly, I analyzed the archaeological evidence from the Pantanello Sanctuary in the 4th and 3rd centuries BC which indicates that the site was occupied by a homestead likely associated with agricultural facilities. A similar structure with similar data was discovered in 2000 by Antonio DeSiena at San Biagio, an important rural sanctuary three kilometers up the Basento valley. This set of archaeological structures and its relationship to the sanctuary have raised questions as to the structures’ function and their meaning in the overall complex of the sanctuary and its cultic practices. All of the above issues will be addressed in volume one of The Chora of Metaponto: The Sanctuaries, which we hope to have completed in 2003.

Ceramics were an essential item of economic transactions as containers for other products and as individual commercial items. Likewise, potters were certainly vehicles of cultural transmission. Itinerant potters certainly influenced local ceramic manufacture and regional styles. For these reasons, and to discover chronological differences between the various datable vessel forms, I have organized our comparative work into three broad geographic areas: 1) southern Italy (south of a line from Paestum on the west to Canosa on the east); 2) northern Italy and southern France; and 3) all other pertinent major Greek sites including Athens. It is hoped that this process will provide clues to the political and economical spheres of influence that affected Metaponto through time.

The results of this comparative study of ceramics from the Pantanello Sanctuary has led to some interesting research questions concerning the variety of functions that an ancient sanctuary might have had. Most important, of course, was as a place designated for cultic practices, with a calendar of religious functions and festivals. In the case of rural sanctuaries like Pantanello, these rites were bound up with the agricultural calendar and with ideas of fertility, death, rebirth, and purification. Literary sources mention specific rituals and some vessel forms that were used in ritual practices or were offered as gifts to the gods. Two other possible cultic functions of sanctuaries that merit further investigation are the imposition and removal of curses and the cure of afflictions.

Another and possibly the most far-reaching of the sanctuary functions was the lending of money to cities and individuals for a vast array of civic and military projects. These monetary resources were lent by the deities and were repaid to the deities. In fact, the monetary resources of various deities were used to erect and repair buildings and city walls, purchase ships, subsidize military campaigns, hire military commanders, buy weaponry, buy and import grain, as well as stabilize the price of commodities.

Sanctuaries also functioned as repositories of history—in a sense, archives—where individuals placed a variety of objects that recorded people and events. Throughout the Greek world, political, military, judicial, and economic events were often recorded in a variety of mediums, such as stone, bronze, and ceramics. Historians such as Herodotus used evidence found at sanctuaries to construct reports of events and chronologies. These included political alliances and a variety of civic and military enterprises, including colonization.

The varied aspects of the cultic life of sanctuaries emphasize the lack of separation between the sacred and the profane within the Greek and the indigenous world, as well as the enormous influence of sanctuaries over the political (sensu lato), social, and economic life of Greek colonizers and the people they colonized. These facts raise the possibility that groups that did not have immediate access to the resources provided by large urban or rural sanctuaries, or that could not meet the social and economic requirements involved, may have elected to congregate around less conspicuous sanctuaries. Sanctuaries such as the one at Pantanello may have fulfilled the need for a place of worship where cultic activities had an even more eclectic character. As Carter has argued, their regular placement suggests that they may have played a role in the organization and administration of the chora and, as De Siena has stated, they might have been associated with particular aristocratic clans or ghene.

The potter’s formal and material choices

The remains of pottery reflect production practices and economic transactions. They also reflect formal and material choices made by the potter. In the clay artifact are embedded cultural notions of that artifact’s preferred type—a potter’s rendition of the ideal type, a mental template.

The evidence for this mental template can be shown in the regularity of decorative band patterns of some vessels and in personalized manufacturing traits, as well as in specific choices of clay products and clay additives or temper. Techniques of systematic, detailed observation provide clues to the former: a human fingerprint. Scientific ana-
lytical techniques, such as neutron activation analysis, provide clues to the latter: a chemical fingerprint. It has been the aim of ICA's Ceramics Group to grasp and document these elements of the potter's mental template.

Systematic laboratory observation by our team has been attuned to minutiae in vessel patterning and production. This work raised issues concerning cultural prescriptions for the ideal type of a vessel, as well as idiosyncratic manufacturing traits of individual potters. This kind of evidence, some of which has temporal implications, is particularly visible in the finewares, especially the black gloss vessels. We were not alone in this quest. In 1997 Dr. Vincenzo Cracolici, a Sicilian archaeologist, ceramicist, and ICA collaborator, finished his doctorate for the University of Lecce on the kiln furniture and vessels excavated from the potters' quarter in the Metaponto city site.

Dr. Cracolici found over 400 human fingerprints in black gloss vessels. With the help of fingerprint experts from the Italian Police, he was able to identify the fingerprints of four distinct craftsmen. This innovative approach permitted Cracolici to go beyond stylistic attribution by estimating the number of potters at a particular ceramic shop, and make some pertinent observations about labor organization. We, too, found many fingerprints, but as Cracolici's study showed, few fingerprints (16 out of 400) match the requirements for individual identification. Dr. Cracolici's innovative observations would not have come to fruition but for the collaboration of the Italian Police.

In the last two years the Ceramic Group looked at many hundreds of black gloss sherds. Through detailed observation and recording it has been possible to document the existence of patterning that exemplifies cultural traditions, as well as personal idiosyncracies.

Cultural patterning is also clearly visible in the Ionic styled cups. From the Pantanello sanctuary we obtained several hundred diagnostic sherds of Ionic styled cups, and of a vessel form that shares several characteristics with the canonic Ionic styled cups but that has a deeper cup and is sometimes called the skyphos a labbro. These vessels span the period from the late 7th through the middle 5th centuries BC. Regardless of the exact chronological placement of these vessels in this area of southern Italy and their relationship in terms of formal characteristics, both types of vessels followed fairly strict canons of manufacture and decoration. The consistency in vessel wall thickness and, most importantly, the extreme regularity of the widths of decorative bands indicate not just cultural standards but a precise toolkit, such as brushes or sticks, that systematically produced bands of exact widths. This is all the more remarkable since cross-cultural studies of modern potters' toolkits show that a potter's tools are characteristically rather opportunistic and highly individualized. Given the quality of craftsmanship and the large number of vessels excavated at Pantanello it is possible to say that these archaic and classical potters were able to produce en masse while retaining precise and comparatively high standards of craftsmanship.

But, if it is possible to see the imprint of a group's cultural standards in the decorative canons of the Ionic styled cups and surmise its conservatism and traditions, it is also possible to detect the individual potter through his idiosyncratic manufacturing traits—his craft prints. Study of the black gloss, in particular, has led to the finding of consistent manufacturing traits indicative of the use of the same tools, sometimes in the construction of the same or similar types of vessels. Although these traits were observed during the laboratory field seasons, their importance only became obvious later. Repeated finding of
equally-spaced scratches on the undersides of bases made
by the potter’s cutting wire; facets to achieve the outside
curvature of small cups or bowls; even scratches made
while shaping the lips of skyphoi—these could only be
made by the same tools, possibly by the same potter during
his life as a craftsman.

This evidence does not date a pot or a series of pots, but
it certainly acts as a time-compressor and strengthens
dating assumptions. We also found consistent vessel con-
struction practices that resulted in manufacturing and
firing problems—and these again indicate a particular
potter’s shop and kiln. One case in point is the tight coiling
in the interior of the bottom of the vessel producing a
conic cavity of uneven thickness that often cracked dur-
ing firing (figure 3.8). Some of these vessel bases can be
mistaken for ritually-killed vessels.

The individual potter also makes choices in raw mate-
rials. These choices bridge cultural and personal notions
of what the final product should be like because they
reflect culturally accepted patterns of form and function,
as well as individual craft strategies to achieve those
patterns. To increase the mineralogical and chemical
database for the clay products from southern Italy and
the Metapontine area in particular, as well as to investi-
gate the possibility that the visual definition of different
clay fabrics could be confirmed by scientific analytical
methods, we had 60 pottery samples submitted to pe-
trographic analysis and about 200 analyzed by neutron
activation (see 2000 Annual Report). These samples
include fine wares, coarse wares, and a variety of vessels
and clay craft items. The neutron activation results (es-
tially “chemical fingerprints”) are still preliminary;
the analysis of the principal components, performed on
log-transformed concentration values, showed a high
degree of intra-group homogeneity, as well as a clear sepa-
rating of all the groups. Only three principal components
were needed to establish a homogenous group while the
norm is at least 10. Hierarchical cluster analysis and dis-

The Roman ceramic materials

While the majority of the Ceramic Project team focused
on the pottery of the Greek period from the sanctuary at
Pantanello—the study of which will comprise the third
volume in the series The Chora of Metaponto—two
experienced students of Roman pottery concentrated on
the extensive material from the Roman ceramic factory
at Pantanello that partially overlays the Sanctuary. This
work will be included in the fourth volume in the series.

Smadar Gabrieli, a Ph.D. candidate at the University of
Sydney and long-time collaborator of ICA, examined the
cookingware and found that local potters were focused on
serving localized markets (see below). Marsha Robbins,
an ICA collaborator working on her Ph.D at the Univer-
sity of Southampton, studied exchange systems in Magna
Graecia through the evidence provided by undecorated
amphorae dated from 700 BC through AD 400. She con-

In terms of visually determined classifications of ware and
fabric, about 60% of the Italian samples fall into group
4 and about 33% into group 1. All wares and fabrics are
represented in both chemical groups, except for greyware
and votive samples. The former fall solely into group 1,
while the latter fall into group 4. Interestingly, undeco-
rated table amphorae and lekanae fall into the rare group
2. In terms of dates, the most relevant preliminary finding
is that all the samples dated from the 5th century BC also
fall in the rare group 2. No other materials dated from
other periods belong to this group.
centrated on the amphorae found at several sites in the Metapontine territory, as well as at the Pantanello site.

Ms. Robbins discovered that economic change is hard to document for any given period. It is not until one has studied all ceramic assemblages found at a given archaeological site that one can recreate a relatively accurate pattern of exchange. For example, the study of amphorae has become one of the most-used indicators of systems of exchange and distribution during Greek and Roman times. While their presence may not necessarily reveal all routes and types of trade, or a precise economic history of the area, amphora offer direct evidence of long-distance and large-scale transactions.

Ms. Robbins' preliminary data concerns the rural sites in the Metapontine territory including 1) the Pantanello Greek Sanctuary and farmhouse complex; 2) the Roman production site, which includes the materials from the top of the hill where the site is located; and 3) the Roman kiln dump (figure 3.10). Based on accepted typological schemes and dates, her findings indicate the presence of transport amphorae (n=18) at the Pantanello Sanctuary from the 7th–6th centuries BC with minimal refuse vessels indicated from the hilltop (n=1) and kiln deposit (n=2). The number of amphorae present at the Pantanello Sanctuary more than doubled during the 5th–4th centuries BC (n=38). No amphorae dated from this period were recovered from the hilltop, and only two were present in the kiln deposit. In the 3rd century BC only six amphorae were present in the Sanctuary/farmhouse complex, while, during the 2nd and 1st centuries BC, 52 amphorae came from the Sanctuary/farmhouse complex and 99 from the kiln deposit. When we compare the ratios of amphora present in the Sanctuary complex from the period of the 7th–6th centuries BC to the 5th–4th centuries BC, and then to the 3rd century BC, the respective ratios are 1 to 2.1 and 3 to 1. The ratio of the number of amphora present in the 4th–5th centuries BC to those present in the 3rd century BC is 6.3 to 1. If the amphorae are indicative of the overall vitality of the Sanctuary-farmhouse complex, then these numbers indicate the prosperity and activity of the Sanctuary during the 5th–4th centuries BC.

Finally, Ms. Robbins raises some pertinent questions that will guide her future work. She considers:

- What was Pantanello’s position in the trading network after the decline of Incoronata?
- Can petrological analysis satisfactorily answer questions of local versus non-local production?

Figure 3.9. Principal components analysis on log-transformed concentration values of rare elements—such as selenium and cerium, which tend to be strong discriminators—shows a high degree of intra-group homogeneity and a clear separation of all groups. Hierarchical cluster analysis and discriminant function analysis confirmed the presence of six distinct groups with a high level of confidence.
Can it be proved that the Pantanello kilns produced amphorae of the Metapontine type, as Carter has suggested, as well as copies of other well-known amphorae types manufactured in the typical Metaponto ceramic fabric?

Her work complements that of others focusing on the importance of trade routes, the role of the Pantanello Sanctuary in the religious and social life of the community, and the use of chemical and mineralogical evidence to illuminate these and other questions.

Ultimately Ms. Robbins’ and Ms. Gabrieli’s work—and that of all the people committed to this project—will merge to complete the puzzle and produce a view of a site that changed through time as its community adapted to the religious, political, and economic events that shaped their lives.

Figure 3.10. The total number of survey sites found containing diagnostic amphorae pieces and the dates given them based on accepted amphorae typologies. [M. ROBBINS]
The water vessels from Oritsano in Sardinia have long been considered far superior to all others on the island. This is in spite of the fact that, from a purely technological point of view, they are inferior: the clay of Oritsano imposes limitations on the way the vessels are thrown and fired, and the resulting vessels are weak and permeable. They are, however, well known not only for keeping the water cool, but also for improving its taste and keeping it fresh for longer periods than any other vessel. The action of water purification is due to ion exchange between the clay and the water, and as a result these vessels are replaced every year or two, when the wall becomes saturated.

These water vessels illustrate a time honored conviction that there is an intimate relationship between manufacturing technology and the function of kitchen vessels—in other words, certain pots make better food. To be more precise, the point is not simply that some pots are better, but rather that different pots are suited for different purposes. When making a vessel, the potter chooses the materials and manipulates them with the function of the end product in mind. When trying to reconstruct the function of kitchen ware from their fragmented remains, we have to try to reconstruct the considerations that dictated the potter’s work. In the following preliminary report of the study of the kitchen ware from the kiln deposit in Pantanello, we present the range of kitchen ware that was produced in the workshop, in conjunction with some aspects of manufacture, and also examine some of the implications for food consumption.

The deposit under study is associated with a pottery workshop on the hilltop at Pantanello, a site excavated and studied by the Institute of Classical Archaeology since 1974. The pottery accumulated in a pit that had previously been used by the workshop as a source of clay. The deposit contains both kiln debris and used vessels that were discarded during the lifetime of the workshop (mid 2nd century BC to late 1st century BC), and for some time later as the pit continued to be used as a dump. The assemblage provides a full range of food processing vessels. They were found in a context that has a legible chronological sequence, as is demonstrated by the dating of the fine “greyware” by our colleague Dr. G.-J. Burgers (figure 3.11).

The possibility of studying a long, uninterrupted sequence of kitchen ware is a fortunate opportunity because the archaeological study of food is a study of differences and changes, which are often subtle. To understand the function of a kitchen, it is not enough to find out which vessels were used at a given moment. The content of kitchens has, by and large, changed surprisingly little over time. We may have lost some specialty vessels such as the glirarium (used by the Romans to fatten door mice), but the similarities are more striking than the differences. We still use deep pots and shallow pans; we still have various bowls and mortars for chopping,
grinding, and mixing. Yet, similarly equipped kitchens produce vastly different types of food. A simple inventory of shapes, though indispensable, will allow us to say but little about the function of the kitchen. Analysis of the composition of the vessels may take us another step forward: a jar with porous body, for example, will keep water cool, but if we want to boil food, though we can use the same shape, it needs to have an impermeable body.

Even if we understand the function of the individual vessels, we can still remain ignorant about basic issues such as how much food was eaten uncooked, or what was the preferred method of cooking, because of the inherent biases of most archaeological assemblages. If, for example, the prevalent vessel found in an assemblage of the kiln dump is the cooking pot, accompanied by relatively few mixing bowls, this would not necessarily mean a preference for stews over salads; it could equally signify that pots subjected to repeated thermal shock break more often. Where we do have a continuous sequence, however, patterns may unfold. If, for example, we find that over time the amount of those same pots, in relation to the same bowls, decreases, we can infer a reduction in the consumption of stews. When we tie such interpretation with studies of botanical remains and of fauna, the picture starts to come to life. We are therefore particularly fortunate in having a long sequence in the context of the multidisciplinary project of ICA, because the information about faunal and botanical remains from Pantanello allows us to reconstruct eating patterns, or at least to identify changes in the way food was processed in a time of social and political change, with increasing Roman involvement in the area.

Let us start with that indispensable inventory list. As we said, the deposit included a full (though not necessarily exhaustive) range of kitchen vessels. We have liquid containers with a long narrow neck that minimizes spillages and is easy to stop (figure 3.12), and others with a wide neck, and either one handle (pitcher) or two (figure 3.13), useful for drawing or decanting water. We have deep globular cooking pots in which one would boil liquids or slowly cook stews and porridges. Their walls are thin and their bases round; both of these are features which minimize damage through heat stress. They are made to accommodate a lid, either on a groove at the base of an everted rim, or on its slope.

A different type of cooking is represented by shallow, flat dishes. Remains of carbonized cakes were found in a pan such as figure 3.15 at Pompeii, which suggests that its development is associated with the consumption of bread. The same pans, or the casseroles, (figure 3.16) were used for baking the patena (similar to modern day quiche) for which Apicius has so many recipes, and to simmer whole fish. These shapes could also be used for frying and roasting. To complete the battery of cooking vessels, we also have examples of a clibanos, the mobile oven that was easy to carry around (figure 3.17). The clibanos was placed as a cover over the food, and embers were heaped around and over it. The flange prevented the embers on the dome from falling down and could be used as a handle. Mixing bowls and mortars, both deep and shallow, with and without a spout, complete the assemblage. Thus we have the full range of vessels necessary in the kitchen: to fetch and carry, to store, to prepare raw ingredients, and to cook.

When we took the second step and looked at the manufacturing technology, we found enough correlation between the composition of the pottery fabric (the types of inclusions, their quantity, the porosity and hardness of the body) and the function of the vessels that we were able to distinguish different functions in similar or identical shapes. One example is that of the wide-mouth jugs that are manufactured in two fabrics, one with lime inclusions, the other without. We know that when this shape has a round base, it was used for cooking, while, if it has a ring foot, it was used for storage and serving at the table. Once we determined that lime inclusions were never used

![Figure 3.12. Jug, with narrow neck to minimize spillage.](image)

![Figure 3.13. Table amphora.](image)
in Pantanello to manufacture cooking ware, we could identify all lime-containing jugs as serving/storage vessels. The rest of the fragments, which have the same fabric as the cooking pots, we consider cooking jugs, and some of them indeed have soot marks.

In this way, by identifying relations between technological attributes and shapes, we have been able to analyze the considerably fragmented material and have been able to quantify the functional types through the sequence. Preliminary results indicate stability throughout the production period in shapes, in sizes, and in relative frequencies of vessels, and therefore probably in the methods of food processing. At the same time there seems to be an increase in the frequency of flat bases for cooking ware relative to that of round bases. If confirmed, this could represent a gradual acceptance of Roman fashion: at the initial stages of production, even though there is at least one new Roman shape, the almond-rim pan (possibly accompanied by new dishes associated with it), the use of the traditional Greek cooking pot with the round base, the chytra, persists. Only gradually is there a shift to the Roman equivalent, the olla, with similar globular deep shape, but a flat base that is more practical for use on flat surfaces.

When we look at the production as a whole, we see stability in the manufacturing technology—in the composition of the pottery fabric and the way the vessels were made—but the production pattern of the workshop changes. There is clearly a considerable reduction over time in the overall amount of material produced by the workshop, but at the same time there is an increase in the amount of kitchen ware produced, not only relative to fine ware, but also, apart from the last production stage, in absolute quantities. It seems that with time the production of the workshop became progressively more limited, concentrating on utilitarian pottery, possibly destined for a more local market.

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Figure 3.15. Shallow, flat dish, possibly associated with bread consumption.

Figure 3.14. Cooking pot with deep, globular shape.

Figure 3.17. Fragment of a clibanos, a type of portable oven.

Figure 3.16. Casserole-like pan, possibly used for cooking patena, a quiche-like dish.
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Final group photograph in front of Dacha 2. [cw]
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2001 Publications by ICA Staff Members and Collaborators

Nikolaenko, G. “La chora di Chersonesos.” 683–688;
Thompson, S. M. “Problemi e principi nella riconoscitione archeologica.” 403–421.


Invited Papers at Meetings by ICA Staff Members and Collaborators

Carter, J. C. “Polychrome Funerary Monuments from the Early Hellenistic Necropolis of Chersonesos on the Black Sea.”
Thompson, S. M., J. Trelogan, and Galina Nikolaenko. “Excavations at Bezymyannaya within the Territory of Greek Chersonesos, Crimea, Ukraine.”
Thompson, S. M. and C. Antonaccio. “Sanctuaries and Social Organization in the Sicilian Interior during the Archaic Period.”
Wade, M. “Human and Chemical Fingerprints: Potters and Pots from Pantanello, Southern, Italy.”


“Lecture I. Archeologi e scienziati in cerca di agricoltori grecol.” (in Italian). (May 21);
“Lecture II. The Early Settlers.” (May 23)
“Lecture III. Dividing the Land.” (May 25)
“Lecture IV. Life, Worship, Death and Rebirth in the Chora.” (May 29)
“Lecture V. Chora e Polis.” (in Italian). (May 31)

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The Honorable Yuri Bohutsky, Minister of Culture and Arts of Ukraine
Mr. Donald Evans, US Secretary of Commerce
The Honorable Konstantyn Hryschenko, Ukrainian Ambassador to the U.S.
The Honorable William Green Miller, former U.S. Ambassador to Ukraine
The Honorable Carlos Pascual, U.S. Ambassador to Ukraine
The Honorable James D. Wolfensohn, President, The World Bank, Washington, D.C.
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Professor Lester K. Little, Director, American Academy, Rome
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IN MEMORIAM
The director and staff of ICA and the Centro di Agoarcheologia note with sadness the passing of
Dr. Michelangelo Lovelli, Regione Basilicata,
a friend and supporter of the Centro.

We shall miss our neighbor, friend, and supporter,
Mrs. Elizabeth McGrosso,
who died in December, 2000.