■ THE MUSEUM APPLIED SCIENCE CENTER FOR ARCHAEOLOGY of the University Museum, Philadelphia, Pa., U.S.A., was initiated in 1961 by Froelich Rainey. Its aim is to apply new principles and technologies developed in the physical sciences to archaeological and anthropological research. The successful application to archaeology of carbon-14 dating, in the laboratory here (established in 1951) and in others, suggested the possibility that many other technological advances might have applications in this field. The investigation of this possibility began with work on thermoluminescence dating of pottery and on the development and use of instruments for archaeological prospecting. An information center and a newsletter were established. Since then, the existing chemistry laboratory has been expanded to include a much more active program of conservation and restoration. Also, work in dendrochronology is being pursued to provide samples of known age for C^{14} dating.

Research on the possibility of using thermoluminescence for dating pottery was started here in 1959 and has been pursued actively since 1962. Significant progress made during the past two years indicates that the method will be a reliable one, possibly as good as C^{14} dating or better. It has the advantage that it dates the artifact itself (a few milligrams of pottery) rather than a charcoal or other carbon sample that is merely (and sometimes erroneously) associated with the occupation level to be dated. The method is based on the fact that particles from traces of radioactive elements in clays bombard the other constituents and raise electrons to metastable levels. When the clay is heated, enough extra energy is supplied to enable the electrons to return to normal states. In this transition each one emits a photon of light. The final heating of a ceramic is, therefore, the starting point of the metastable electron accumulation. In the laboratory, a few milligrams are ground, mounted, and heated very rapidly so that as much of the light output as possible is detected before the onset of heat radiation. The light output is detected by a photomultiplier tube, amplified, and recorded against the temperature on an X-Y recorder. The rate of radioactive bombardment is also measured. The variations among clays in susceptibility to radiation damage is corrected for by artificial bombardment with X-rays and subsequent remeasurement of the glow curve.

The work of MASCA on the development of instruments for archaeological prospecting was undertaken in the light of the great need for the acceleration of the finding of sites and for the delineation of structures within sites already found. The destruction of many sites is imminent, due to the rapid encroachment of modern civilization. Also, with the cost of labor increasing all over the world, it is becoming impractical to excavate unless there is a certainty that structures or levels of habitation will be found. MASCA has tested a number of instruments that have seemed suitable for archaeological exploration. These include the Elsec proton magnetometer, the Gossen Geohm, and various metal detectors and seismographs. In the course of the search for the ancient Greek city of Sybaris, buried at depths of 4–6 m., it was found that proton magnetometers were not sufficiently sensitive for the detection of structures or archaeological deposits at these depths. At MASCA's request, the engineering firm Varian Associates designed and developed a more sensitive portable cesium magnetometer, with digital readout and differential mode of operation. This has now been tested in two field seasons and has proved to be the ideal instrument for archaeological prospecting in regions that are normally magnetically quiet and where the features sought present some contrast in magnetism. Again, it was found that the wavelengths of standard seismographs were too long to be used in finding archaeological features, usually located above much more massive geological ones. Experiments directed toward the development of a sonic instrument have produced much information about the problems involved, but a successful portable design has not yet been achieved.

The chemistry laboratory of the Museum has long been concerned with providing analyses of archaeological specimens to assist in their precise identification. In recent years, increasing emphasis has been placed on the stabilization of specimens to prevent any further disintegration due to excessive damp or dryness or to the industrial atmosphere.

The radiocarbon laboratory, one of the few in the world that has devoted itself almost exclusively to the dating of archeological and anthropological samples, has published over 1,000 C^{14} dates, representing 113 archaeological sites and contributing to the establishment of chronologies for four main regions of the world —the Near East and Mediterranean regions, Central America, South America, and the Arctic. Among its intensive studies have been the correlation of the Mayan calendar with the Christian, the dating of some of the earliest sites and the elucidation of human migrations in the western Arctic, the dating of occupations and climatic sequences for what is apparently the earliest site in eastern North America, and comprehensive dating programs permitting archaeological interpretation of Mesolithic-Neolithic-Chalcolithic transitions in the Near East and the Anatolian Plateau.

A program in dendrochronology (tree-ring dating), being conducted in collaboration with the University of Arizona, is providing samples of *Sequoia gigantea* and *Pinus aristata* of known age (back to 5100 B.C.) for C^{14} dating in an attempt to detect small fluctuations in the atmospheric C^{14} inventory in the past. When the magnitude and duration of these fluctuations are known, it may be possible to correlate them with changes in cosmic-ray intensity, the intensity of the magnetic field of the earth, and/or the equilibrium conditions (the balance between the atmosphere and oceans). The C^{14} dates for these samples of known age will also provide correction factors for the dating of archaeological specimens of unknown age.

The MASCA Information Center maintains a catalogue of scientific techniques of value to archaeology and anthropology, consisting of abstracts of articles, references, and information on new developments culled from many publications in diverse fields, as well as unpublished material gathered from correspondence and experimental notes. A newsletter, in which current developments in the field of techniques are reported, is published approximately three times a year. Copies are made available, free of charge, to all interested persons. The mailing list and the roster of contributors are international. There is a continuing need for notes and reports. All persons engaged in work involving new techniques applicable to archaeology are urged to send information to Jeannette Flamm, Editor, *MASCA Newsletter*, The University Museum, 33rd and Spruce Streets, Philadelphia, Pa. 19104, U.S.A.

■ THE MUSEUM APPLIED SCIENCE CENTER FOR ARCHAEOLOGY of the University Museum, Philadelphia, Pa., U.S.A., was initiated in 1961 by Froelich Rainey. Its aim is to apply new principles and technologies developed in the physical sciences to archaeological and anthropological research. The successful application to archaeology of carbon-14 dating, in the laboratory here (established in 1951) and in others, suggested the possibility that many other technological advances might have applications in this field. The investigation of this possibility began with work on thermoluminescence dating of pottery and on the development and use of instruments for archaeological prospecting. An information center and a newsletter were established. Since then, the existing chemistry laboratory has been expanded to include a much more active program of conservation and restoration. Also, work in dendrochronology is being pursued to provide samples of known age for C^{14} dating.

Research on the possibility of using thermoluminescence for dating pottery was started here in 1959 and has been pursued actively since 1962. Significant progress made during the past two years indicates that the method will be a reliable one, possibly as good as C^{14} dating or better. It has the advantage that it dates the artifact itself (a few milligrams of pottery) rather than a charcoal or other carbon sample that is merely (and sometimes erroneously) associated with the occupation level to be dated. The method is based on the fact that particles from traces of radioactive elements in clays bombard the other constituents and raise electrons to metastable levels. When the clay is heated, enough extra energy is supplied to enable the electrons to return to normal states. In this transition each one emits a photon of light. The final heating of a ceramic is, therefore, the starting point of the metastable electron accumulation. In the laboratory, a few milligrams are ground, mounted, and heated very rapidly so that as much of the light output as possible is detected before the onset of heat radiation. The light output is detected by a photomultiplier tube, amplified, and recorded against the temperature on an X-Y recorder. The rate of radioactive bombardment is also measured. The variations among clays in susceptibility to radiation damage is corrected for by artificial bombardment with X-rays and subsequent remeasurement of the glow curve.

The work of MASCA on the development of instruments for archaeological prospecting was undertaken in the light of the great need for the acceleration of the finding of sites and for the delineation of structures within sites already found. The destruction of many sites is imminent, due to the rapid encroachment of modern civilization. Also, with the cost of labor increasing all over the world, it is becoming impractical to excavate unless there is a certainty that structures or levels of habitation will be found. MASCA has tested a number of instruments that have seemed suitable for archaeological exploration. These include the Elsec proton magnetometer, the Gossen Geohm, and various metal detectors and seismographs. In the course of the search for the ancient Greek city of Sybaris, buried at depths of 4–6 m., it was found that proton magnetometers were not sufficiently sensitive for the detection of structures or archaeological deposits at these depths. At MASCA's request, the engineering firm Varian Associates designed and developed a more sensitive portable cesium magnetometer, with digital readout and differential mode of operation. This has now been tested in two field seasons and has proved to be the ideal instrument for archaeological prospecting in regions that are normally magnetically quiet and where the features sought present some contrast in magnetism. Again, it was found that the wavelengths of standard seismographs were too long to be used in finding archaeological features, usually located above much more massive geological ones. Experiments directed toward the development of a sonic instrument have produced much information about the problems involved, but a successful portable design has not yet been achieved.

The chemistry laboratory of the Museum has long been concerned with providing analyses of archaeological specimens to assist in their precise identification. In recent years, increasing emphasis has been placed on the stabilization of specimens to prevent any further disintegration due to excessive damp or dryness or to the industrial atmosphere.

The radiocarbon laboratory, one of the few in the world that has devoted itself almost exclusively to the dating of archeological and anthropological samples, has published over 1,000 C^{14} dates, representing 113 archaeological sites and contributing to the establishment of chronologies for four main regions of the world —the Near East and Mediterranean regions, Central America, South America, and the Arctic. Among its intensive studies have been the correlation of the Mayan calendar with the Christian, the dating of some of the earliest sites and the elucidation of human migrations in the western Arctic, the dating of occupations and climatic sequences for what is apparently the earliest site in eastern North America, and comprehensive dating programs permitting archaeological interpretation of Mesolithic-Neolithic-Chalcolithic transitions in the Near East and the Anatolian Plateau.

A program in dendrochronology (tree-ring dating), being conducted in collaboration with the University of Arizona, is providing samples of *Sequoia gigantea* and *Pinus aristata* of known age (back to 5100 B.C.) for C^{14} dating in an attempt to detect small fluctuations in the atmospheric C^{14} inventory in the past. When the magnitude and duration of these fluctuations are known, it may be possible to correlate them with changes in cosmic-ray intensity, the intensity of the magnetic field of the earth, and/or the equilibrium conditions (the balance between the atmosphere and oceans). The C^{14} dates for these samples of known age will also provide correction factors for the dating of archaeological specimens of unknown age.

The MASCA Information Center maintains a catalogue of scientific techniques of value to archaeology and anthropology, consisting of abstracts of articles, references, and information on new developments culled from many publications in diverse fields, as well as unpublished material gathered from correspondence and experimental notes. A newsletter, in which current developments in the field of techniques are reported, is published approximately three times a year. Copies are made available, free of charge, to all interested persons. The mailing list and the roster of contributors are international. There is a continuing need for notes and reports. All persons engaged in work involving new techniques applicable to archaeology are urged to send information to Jeannette Flamm, Editor, *MASCA Newsletter*, The University Museum, 33rd and Spruce Streets, Philadelphia, Pa. 19104, U.S.A.