

TABLE I

Summary of MASCA Instrument Surveys

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
<u>THE NEW WORLD</u> <u>U. S. A.</u>				
Independence Square Philadelphia, Pa.	house foundations	excessive magnetic disturbances due to city location	good detection	
Rifle Works, Harpers Ferry, W. Virginia	structure of Rifle Works	excessive disturbances from modern iron	located turbine pit	seismograph provided some indication of turbine pit
Isle Royal, Lake Superior, Michigan	copper ore deposits	not suitable	not suitable	some hot spot were found with metal detector
Fort Loudon, near Chambersburg, Pa.	trenches and embankments of fort	indications of location of trenches and embankments	not suitable	
Caleb Pusey House, Chester, Pa.	house and other building foundations	excessive magnetic disturbances due to location near town	excellent detection of eastern extension of house - later confirmed by excavation	
Hagley Mills, Wilmington, Del.	structures of powder works	located large conduit and many large iron fragments	some indication of location of conduit	metal detector revealed presence of many large iron fragments and metal pipes

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
Eleutherian Mills, near Wilmington, Del.	features of the garden of former residence of E. I. duPont	pieces of modern iron caused confusion	good detection of well, drain, and other features	
Hope Lodge, Whitemarsh, Pa.	foundations of mansion and out-buildings	not tested	good detection of foundations	
Snaketown, near Chandler, Arizona	features from period of A.D. 1 to 1400	excellent detection of large firepits - confirmed by excavation	not suitable	
Salvage site, near San Xavier, Arizona	small features representative of Indian occupation	test site for new cesium magnetometer; site was not especially suitable for magnetometers	not suitable	
Buttes Dam Site, So. of Tucson, Arizona	Indian occupation site	presence of magnetic volcanic rocks negated usefulness of magnetometer	not suitable	
Camden, South Carolina	wooden structures of Revolutionary Fort Camden	remains of structures sought did not offer magnetic contrast: located unsuspected gas pipeline	sandy soil and hence poor coupling to ground provided false anomalies	standard aerial photograph shows small variations in vegetation may correlate structures so
Harvard Forest, Petersham, Mass.	collaboration with soil scientists to find out if different types of soil in this region differed in magnetism	magnetic bedrock at variable depths negated usefulness of magnetometer	not suitable	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
St. Croix Island, near Calais, Maine	former structures of early French settlement, A.D. 1604	detected a number of anomalies, probably representative of structures and graves	numerous ant hills and looseness of the soil due to the activity of ants or other causes, such as excess sand, caused false anomalies.	
Beverwyck Manor, New Jersey	Foundations of original Manor House	anomalies found		
Mount Clare House, Baltimore, Md.	Tunnel leading from house	not suitable	found foundations extending from house	
<u>CANADA</u>				
Fort Louisbourg, Nova Scotia	graves and tunnels under embankments	excellent detection of graves; vague indications of tunnels	grave detection confirmed by proximity of bedrock; some indication of tunnel locations	seismograph confirmed that bedrock was only 10 ft. deep; many iron objects detected with metal detector
Fort Lennox, Ile-aux-Noix, Quebec	many structures and graves	good indication of region of structures, but not so precise as resistivity; good detection of graves	excellent pinpointing of structures confirmed by excavation	metal detector detected various tal objects at shallow depths; seismograph gave vague indication of bedrock
Campbellton, New Brunswick	Sunken ships	trial survey made on ice; good anomalies over known locations of two ships; to be continued this winter over unknown ships	not suitable	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
<u>CENTRAL AMERICA</u>				
Tikal, Guatemala	buried structure in N. Acropolis, W. Plaza, and Temple I	unable to tune proton magnetometer for magnetic field in this region	anomalies confused by structures too complex; could not distinguish structures from pits	
San Lorenzo, Veracruz, Mexico	Olmec monuments 1200-900 B.C.	excellent detection of monuments due to the fact that they were made of magnetic basaltic rock	not needed	
<u>NEW WORLD</u>				
Etzatlán, Jalisco, Mexico	Jalisco shaft tombs	top soil too magnetic	Experiments with new Bison Si. Enhancement Seismograph, but difference in velocity between loose top soil and shafts.	
<u>THE OLD WORLD</u>				
<u>IRELAND</u>				
Novan Fort, near Armagh, N. Ireland	mound site	indecisive results	not suitable	
Dun Ailinne, near Kilcullen, County, Kildare.	traditional royal site; possible seat of the "High Kings"	detected large anomaly representative of center of Iron Age occupation	anomalies confused by proximity of bedrock and boulders	
<u>TURKEY</u>				
Gordion	location of tombs under tumuli; structures on city mound; Persian road	variable magnetic earth caused anomalies much larger than ones anticipated from	located Persian road where it existed; and structures on city mound to depth of 2-3 meters	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
<u>ITALY</u>				
Sybaris	the 7th - 6th century B.C. city	See Rainey, F. and Lerici, C. <u>The Search for Sybaris</u> , 1967 MASCA used magnetometers at this site for a total of 2 years (over an 8-year period)		
Tarquinia and Cervetri	Etruscan tombs	reasonably good detection of tombs	approximately 50% detection of tombs, but very slow	seismograph not useful
Artena	city walls and structures	magnetic earth negated usefulness of magnetometer	good detection of foundation walls of structures	
Foce del Sele, near Paestum	6th century, B.C. Greek sanctuary	no archaeological features were detected although most of the zone of interest was surveyed	not suitable on alluvial plain	
Metapontum	6th century, B.C. and later Greek city	excellent detection of walls and structures	not suitable	magnetometer anomalies help to confirm and clarify anomalies detected in aerial photographs
Gravina	structures from many periods	many anomalies, but correspondence was confused because of presence of structures almost everywhere	not tested	

site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
Veio	city site	erroneous anomalies, due to magnetic earth	ground was too dry in summer	
Siris	6th century B.C. Greek city	no true anomalies found; confirmed by drilling	not suitable	anomalies seen infrared aerial photographs proved to be erroneous
<u>GREECE</u>				
Halice	7th - 6th century B.C. city	whole area covered with modern iron	not suitable	
Porto Cheli	4th century B.C. harbor walls	structures not detected due to lack of contrast in magnetism	ground was too dry in August; should be tried in wetter season	
Thera	Bronze Age structures	presence of magnetic volcanic gravel negated usefulness of magnetometer	not suitable due to loose pumice and great depth of structures	seismograph provided some indication of depth of bedrock and hence, thickness of pumice layer
Elis	5th and 4th century B.C. city	excellent detection of walls which will enable reconstruction of part of the city plan	not suitable	
<u>YUGOSLAVIA</u>				
Divostin and other sites near Kragujevac	Neolithic houses	excellent detection of burned Neolithic house floors, and even of "city" plan at Grivac	not suitable	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
<u>ITALY</u>				
Ciro	other structures in region of Greek temple	several anomalies that may represent buried structures	not suitable	
Cosa	Roman harbor	magnetic earth	detection of some anomalies	
Gravina di Puglia	Neolithic occupation sites	good success in finding pits in tufa bedrock, pits representative of occupations	not required	
<u>FRANCE</u>				
Aleria, Corsica	Etruscan tombs	found Roman kiln with roof intact, and very early (possibly) Etruscan tombs	not suitable	
Wissant, near Calais	Roman fortress	promising anomaly found within the high enclosure	not required	
<u>ENGLAND</u>				
Kingscote, Gloucestershire	Roman structures	found many promising anomalies	not required	Anomalies were in exact corresponden with ones detected in aerial photographs

TABLE I

Summary of MASCA Instrument Surveys carried out
since 1972

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
<u>THE NEW WORLD</u>				
<u>U.S.A.</u>				
Yellow Springs, Pa.	colonial period hospital buildings	modern surface iron and large geological gradient obliterated most of survey		aerial photos onl good for site record
Cahokia Mounds, Illinois	Indian house pits and trenches	average gradient less than 0.5 gamma per meter; possible stream channel gave only definite anomaly		
Governor Printz Park, Pennsylvania	colonial Swedish buildings	one excavated anomaly was modern iron		
Fort de Chartres, Illinois	outbuildings of French fort	none detected and none found in later excavation		
Fort Hill, Pennsylvania	Indian habitation and excavations	no significant contrast	geological anomaly	aerial photograph revealed crop marks
Cummins Prison, Arkansas	extent of grave site	disturbed by modern iron, but possibly delimited		
Schaefferstown, Pa.	foundation of Stiegel Tower	anomalies due to iron wire	anomaes due to tree roots and animal burrows	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
Valley Forge, Pa.	colonial house pits and earthworks	possible detection of house pits	possible detection of house pits	aerial photograph showed road and many other marks. gamma-ray spectrometry revealed anomalies some geological
Lemon Hill, Philadelphia	colonial pathway and greenhouse			aerial photograph could not definitely detect
Bartram's Gardens, Philadelphia	colonial buildings			aerial photos detected gravel pathway
Odessa, Delaware	buildings near Wilson-Warner House	strong anomalies, probably caused by iron	good, but unverified anomalies	colonial roadway detected with aerial photograph
West Chester, Pa.	Brinton Cabin site		anomalies caused by tree roots	no significant anomalies with aerial photograph
Waynesborough, Pa.	colonial outbuildings			too much brush for aerial photography
Franklin Square, Pa.	colonial buildings		gravel pathway detected	
Fort McHenry, Maryland	outbuildings around fort			foundations of Civil War period hospital found with aerial photography
Mont Clare House, Baltimore, Maryland	colonial buildings		part of building foundation	

Site	Buried Features Sought	Magnetometers	Resistivity Instruments	Supplementary Instruments
Stenton Mansion, Philadelphia	structures around colonial building			ground penetrating radar confirmed known features and found many new anomalies
Chaco Canyon, New Mexico	stone walls within Pueblo Benito and Pueblo Alto and Anasazi roadway	only geological features detected		aerial photograph helped with road mapping; ground penetrating radar detected some walls
White Mountains, California	ancient bristlecone pines in alluvial fans			ground-penetrating radar detected only boulders
Glendive, Montana	Indian sites and early man habitations			no indication with aerial photography
<u>PUERTO RICO</u>				
Coamo, Puerto Rico	Indian structures			aerial photograph reveals possible field pattern
<u>CENTRAL AMERICA</u>				
Quiriguá, Guatemala	Mayan stone structures	mapped possible causeway		aerial photos revealed no buried structures
<u>CANADA</u>				
Les Forges du Saint-Maurice	colonial period industrial buildings	iron-containing slag yielded many significant anomalies		aerial photograph showed some grass patterns

EXPEDITIONS OF THE MUSEUM APPLIED SCIENCE CENTER

FOR ARCHAEOLOGY 1960-1976

ARIZONA

- 1961, 65 Buttes Dam site, north of Tucson. E.K. Ralph and Varian Associates. Instrument survey. Elizabeth K. Ralph, "Archaeological Prospecting," Expedition vol. 11, no. 2, Winter 1969.
- 1965 Snaketown. H. Bergh. Instrument survey. Ibid.
- 1972 Flagstaff, study of magnetic pole reversals. E.K. Ralph. Part of E.K. Ralph Ph.D thesis (unpublished).

ARKANSAS

- 1974 Arkansas State Prison. Magnetic survey. Bruce Bevan. Field report in MASCA files.

BRITAIN

- 1970 Southern England. Aerial survey. MASCA and Royal Commission on Historical Monuments (England).
- 1971 Kingscote. Magnetic survey. (Follow-up to aerial survey) E.K. Ralph. J.N. Hampton, "An experiment in multispectral air photography for archaeological research," and Elizabeth K. Ralph, "Cesium Magnetometer survey at Kingscote, Gloucestershire, England," Appendix D. In Photography in Archaeological Research, Elmer Harp, Jr. Editor, School of American Research Advanced Seminar Series, University of New Mexico Press, Albuquerque, pp. 157-202.

1975

- Dorchester. Satellite photographic experiment. F.G. Rainey, J.N. Hampton, B.W. Bevan, "Detection of crop mark contrast for archaeological surveys," final report for Goddard Space Flight Center, April 1976.

CALIFORNIA

1975

- White Mountains. Search for buried bristlecone pines. H.N. Michael with L. Dolphin and R. Vickers of SRI. Ground penetrating radar equipment. H.N. Michael and R.S. Vickers, "Subsurface radar probing for detection of buried bristlecone pine wood." Paper presented at the 9th International Radiocarbon Conference held in Los Angeles, California, and San Diego, California, June 20-26, 1976. (To be published in the Proceedings of the Conference). NSF film for television "How old is old?".

CANADA

1963

- Louisbourg Fortress, Nova Scotia. Instrument surveys. E.K. Ralph, "Archaeological Prospecting," Expedition vol. 11, no. 2, Winter 1969.

1964

- Fort Lennox, Ile-aux-Noix. Instrument surveys. E.K. Ralph and MASCA staff. MASCA Newsletter vol. 1, no. 1, February 1965, and Expedition vol. 11, no. 2, Winter 1969.

Cambellton, New Brunswick. Magnetometer trial survey on ice. E. K. Ralph. Ibid.

CANADA (contd.)

- 1975 Les Forges du Saint-Maurice, Trois Rivieres. Magnetic survey. Bruce Bevan. "A magnetic survey at les Forges du Saint-Maurice," MASCA Newsletter vol. 11, no. 2, December 1975.

CORSICA

- 1971 Aleria, Magnetometer survey. F.G. Rainey and E.K. Ralph. Report in MASCA files.

DELAWARE

- 1963-64 Hagley Museum, Du Pont Black Powder Works. E.K. Ralph, "Archaeological Prospecting," Expedition vol. 11, no. 2, Winter 1969.
- 1968 Wilmington, Eleutherian Mills. Magnetic survey. E.K. Ralph. Ibid.
- 1974 Odessa, Wilson-Warner House. Two instrument surveys. MASCA staff. Report in MASCA files. Published in local Odessa newsletter.

EGYPT

- 1973 Malkata, site near Luxor. Cesium magnetometer survey. E.K. Ralph. MASCA Newsletter vol. 9, no. 2, December 1973.

FRANCE

- 1969 St. Gilles (Languedoc). Magnetometer survey. John Winter. MASCA Newsletter vol. 5, no. 2, November 1969.
- 1969 Vix. Magnetometer survey. John Winter. Ibid.
- 1971 Camp de Cesar, Wissant. Instrument survey. F.G. Rainey and E.K. Ralph. Field report in MASCA files.

GREECE

- 1966 Helice. Instrument survey. E.K. Ralph. "Archaeological Prospecting," Expedition, vol. 11, no. 2, Winter 1969.
- 1966 Porto Cheli. Instrument survey. E.K. Ralph. Ibid. MASCA Newsletter vol. 2, no. 2, December 1966.
- 1967-68 Eilis and Island of Thera. E.K. Ralph. Instrument survey. MASCA Newsletter vol. 3, no. 2, Nov. 1967 and vol. 4, no. 2, Nov. 1968, Expedition vol. 11, no. 2, Winter 1969, pp. 14-21
- 1967 Porto Cheli. Balloon photography and photogrammetry. J. Whittlesey. MASCA Newsletter, vol. 3, no. 2, Nov. 1967.
- 1971,72 Greek ports (Porto Cheli). Balloon photography. J. Whittlesey. MASCA Newsletter vol. 7, no. 2, Dec. 1971.

GUATAMALA

- 1962 Tikal. Instrument survey. R.E. Linington. E.K. Ralph, "Archaeological Prospecting," Expedition vol. 11, no. 2, Winter 1969.
- 1976 Quirigua. Magnetic survey. Bruce Bevan. To be published.

ILLINOIS

- 1975 Fort de Chartres. Magnetic survey. Bruce Bevan. Report in MASCA files.
- 1976 Cahokia Mounds. Magnetic survey. Bruce Bevan and Jeff Klein. Report in MASCA files.

IRAN

- 1965-70 Hasanlu. MASCA conservation experiments. D. Butterbaugh. Progress reports
1975 in MASCA files.
- 1972 Tepe Malyan. E.K. Ralph. Report in MASCA files.

IRELAND

- 1963 Navan Fort. Magnetic survey. E.K. Ralph, "Archaeological Prospecting" Expedition vol. 11, no. 2, Winter 1969, pp. 14-21.
- 1968 Dun Ailinne. Instrument surveys. E.K. Ralph, B. Wailes, K. Ryan. Ibid. MASCA Newsletter vol. 4, no. 2, Nov. 1968.
- 1974-75 Dun Ailinne. Resistivity surveys of entrance-way. K. Ryan. Report in
1977 MASCA files.

ITALY

- 1961 Cerveteri. Instrument survey. F.G. Rainey and R.E. Linington. R.E. Linington, "Test use of a gravimeter on etruscan chamber tombs at Cerveteri," Prospezioni Archeologiche vol. 1, 1966, pp. 37-41.
- 1961 Tarquinia. Instrument surveys. F.G. Rainey and R.E. Linington. E.K. Ralph, "Archaeological Prospecting," Expedition, vol. 11, no. 2, Winter 1969, pp. 14-21.
- 1961-68 Sybaris. Instrument surveys. F.G. Rainey and E.K. Ralph. F. Rainey, C. Lerici et al. The Search for Sybaris 1960-1965, 2 vols. (text plus map supplement) 1967, Lerici Editori, Roma. F. Rainey, "Electronics to the rescue in the search for the lost city of Sybaris: Discoveries by a joint U.S.-Italian Expedition-Parts 1 and 2. Illustrated London News Dec. 8, 1962 and Dec. 15, 1962. E.K. Ralph, "Prospezioni Geofisiche," In: Relazione sulla Esplorazione Geofisica eseguita a Sibari, 1962, Fondazione Ing. C.M. Lerici del Politecnico- Milan. O. Bulitt, "Search for Sybaris," 1969, J.B. Lippincott Company, Philadelphia and New York. C.M. Lerici, "Avventura a Sibari," Conversazione Tenuta nella Riunione del 5 maggio 1964 al Rotary Club di Roma.

ITALY (contd.)

- 1965 Metaponto. Magnetic survey (follow-up to aerial survey). E.K. Ralph, MASCA Newsletter, vol. 1, no. 2 Dec. 1965 and Expedition vol. 11, no. 2, Winter 1969.
- 1966 Artena. Resistivity survey. E.K. Ralph. MASCA Newsletter vol 1, no. 2, Dec. 1969 and vol. 2, no. 2, Dec. 1966. E.K. Ralph, "Archaeological Prospecting," Expedition vol. 11, no. 2, Winter 1969, pp. 14-21.
- 1966 Sele. Magnetic survey. E.K. Ralph. Ibid.
- 1966 Veii. Instrument surveys. E.K. Ralph. Ibid.
- 1967 Siris. Magnetic survey. E.K. Ralph. Ibid.
- 1969 Ciro. Instrument survey. E.K. Ralph. Field report in MASCA files.
- 1971 Gravina. Magnetic survey. E.K. Ralph. Expedition vol. 11, no. 2, 1969, MASCA Newsletter vol. 8, no. 1, Dec. 1972.

LEBANON

- 1972 Sarepta. Balloon photography. J. Whittlesey. Report in MASCA files.

MARYLAND

- 1973 Baltimore. Resistivity survey. E.K. Ralph and B. Bevan. Field report in MASCA files.
- 1974 Fort McHenry. Aerial survey. Bruce Bevan. To be published.
- 1977 Mont Clare House, Baltimore. Resistivity survey.

MASSACHUSETTS

- 1966 Harvard, Forest, Petersham. Attempt to measure soil variation with cesium magnetometer. MASCA Newsletter vol. 2, no. 2, Dec. 1966.

MEXICO

- 1960 Cerro de las Mesas near Vera Cruz. Resistivity survey. F. Rainey.
- 1968-69 San Lorenzo, Vera Cruz. Olmec site. Cesium magnetometer survey and aerial survey. F. Rainey and E.K. Ralph. MASCA Newsletter vol. 5, no.1, May 1969 and vol. 6, no. 1, May 1970. Sheldon Breiner and Michael D. Coe, "Magnetic Exploration of the Olmec Civilization," American Scientist vol. 60, no. 5, Sept.-Oct. 1972, pp. 566-575.
- 1971-72 Etzatlán. Cesium magnetometer survey and aerial survey. F. Rainey, E.K. Ralph, B. Bevan. MASCA Newsletter vol. 7, no. 1, June 1971.

NEW JERSEY

- 1970 Marlton, Savich Farm. Magnetic survey. MASCA staff. Field report in MASCA files.
- 1970 Parsippany-Troy Hills, Beverwyck Manor site. Magnetic survey. MASCA staff. Report in MASCA files.

NEW MEXICO

- 1972 Chaco Canyon. Aerial survey. B. Bevan. T.R. Lyons, R.K. Hitchcock, J.I. Egbert, "Aerospace Archaeology: Progress Report and Proposal." New Mexico Archeological Center Remote Sensing Project, 14 March 1973.
- 1973 Chaco Canyon. Magnetic survey. B. Bevan.
- 1974-75 Chaco Canyon. Radar survey. SRI and B. Bevan. Roger S. Vickers and Lambert T. Dolphin, "A communication on an archaeological radar experiment at Chaco Canyon, New Mexico," MASCA Newsletter vol. 11, no. 1, May 1975.

PENNSYLVANIA

- 1963 Chester, Caleb Pusey House. E.K. Ralph. Expedition vol. 11, no. 2, 1969, MASCA Newsletter vol. 2, no. 2, Dec. 1966.
- 1963 Hopewell village. Instrument survey. E.K. Ralph and O. Colburn. Not published.
- 1965 Graeme Park, and Hope Lodge, Ephrata Cloister. Resistivity survey. H. Borstling. Expedition vol. 11, no. 2, 1969 and MASCA Newsletter vol. 1, no. 2, Dec. 1965.
- 1968 Norwood, Morton Mortonsen House. Instrument surveys. E.K. Ralph. Field report in MASCA files.
- 1972 West Chester, Brinton, Cabin. Resistivity survey. B. Bevan and M. Becker. Report in MASCA files.
- 1974-75 Philadelphia, Independence Hall. Resistivity survey. B. Bevan, J. Kenyon. Field report in MASCA files.
- 1975 Stenton Mansion. Radar survey. J. Kenyon and B. Bevan, "Ground-penetrating radar for historical archaeology," MASCA Newsletter vol. 11, no. 2, Dec. 1975, pp. 2-6.
- 1975 Schaefferstown. Instrument survey. B. Bevan. Report in MASCA files.

PUERTO RICO

- 1975 Las Flores. Aerial photography. B. Bevan. Report in MASCA files.

SOUTH CAROLINA

- 1965 Camden. Instrument surveys. E.K. Ralph. MASCA Newsletter vol. 1, no. 2, Dec. 1965. Expedition vol. 11, no. 2, 1969, pp. 14-21.

ASCA INSTRUMENT SCHEDULE 1961-1962

9/24/62

Dates	Resistivity Instruments Geohms made by Gossen Co., Germany			Proton Magnetometer "Elsec" made by Littlemore Scient- ific Co., Oxford, Eng.	Gradiometer made by MacLaughlin Electronics, Perkiomenville, Pa.	Metal Detector made by Goldak Co. Glendale, Calif.	Sonic Device	
	Unit #1	Unit #2 (Also Seismic Instrument made by Geophysical Specialties Ed., Minnesota)	Unit #3				Prototype made by MacLaughlin Electronics, Perkiomenville, Pa.	Research
Fall 1961.			Both instruments used by F. Rainey, R. Livingston in collaboration with Lerici Foundation at Targuonia, Cervetri, and Sibaris, Italy (Tests made also with Seismic Unit)				development & construction	
Winter 1961-62	Taken to Guatemala by Michael D. Coe (Yale Univ.) for use on west coast alluvial sites	Trials over known walls by ASCA staff & students at Independence Square, Phila.	Italy	Italy			Construction & Preliminary tests over known walls by ASCA staff at Independence Square, Phila.	
Spring 1962			Both instruments used again by F. Rainey, E. Ralph in collaboration with Lerici Foundation in search for 6 th Century B.C. Greek Sibaris, Italy		Initial trials by E. Ralph & M. Aitken (Oxford Univ.) at Sibaris, Italy	Tests by E. Ralph & Carabelli (Lerici Polytechnic Inst., Milan) at Sibaris, Italy	Field trials by E. Rainey & E. Ralph at Sibaris, Italy	Texas Instruments Co. & MacLaughlin Electronics & Petty Geophysical Co., Texas
Summer 1962		Both instruments used by H. Carson in collaboration with J. Cotter, E. Larrabee, & other members of the National Park Service at site of U.S. Rifle Works, Harper's Ferry, W. Virginia		Repaired at Oxford				

APPLIED SCIENCE CENTER FOR ARCHAEOLOGY, UNIVERSITY MUSEUM, UNIVERSITY OF PENNSYLVANIA

Archeological and geological equipment to be taken temporarily to Italy by Elizabeth K. Ralph

ITEM	VALUE	DATE PURCHASED	PURCHASED FROM:	COMMENTS
Elsec Proton Magneto-meter Type 592/7 Serial No. 112	\$2700.00	11/18/60	The Littlemore Scientific Engineering Co., Railway Lane, Littlemore, Oxford, Eng.	This instrument is now in England, but was previously imported into the USA and the duty paid.
Geohm Type 323, Serial No. 3519, made by Gossen Co., Erlangen, Bavaria	95.63	3/61	National Electronics P.O. Box 1237 Sheridan, Wyoming	
Prototype Sonic Device, sometimes called a "Seismic Probe"	1500.00	3/62	Designed and constructed for the University Museum by MacLaughlin Electronics, Perkiomenville, Pa.	
Tektronix Portable Oscilloscope Type 321 with rechargeable batteries and additional Cathode Ray Tube with Type P-7 phosphor	900.00	3/63	Tektronix Inc. 126 Presidential Blvd. Bala Gynwyd, Pa.	
CIC (California Instruments Corp.) Wideband DC Amplifier Model 3104 and Differential Input Mode Model D3PB	825.00	3/63	Burlingame Associates 222 Long Lane Upper Darby, Pa.	
Brush Amplifier Model BL201B8 and Recorder Model BL905 (Selectronics No. S-6345)	99.50	11/1/62	Selectronics, A. Silver & Sons 1207-25 S. Napa St., Philadelphia 46, Pa.	
Battery Charger and Miscellaneous Batteries and Small Tools, incl. <i>Triplet vms</i>	100.00	1/63	Black and Decker Co. 333 N. 20th St. Philadelphia, Pa. (Charger and batteries)	

TOTAL VALUE

~~\$6220.13~~

Fisher M-Scope \$150.00

USA

February 15, 1963

III. INSTRUMENT SURVEYS CONDUCTED

P.1

A. Sybaris -

Proton Magnetometer, Geohm, tests of sonic prototype, & std seismograph

B. Other Italian Sites - Tarquinia & Cerveteri

Proton Magnetometer, Geohm?, tests of std seismograph

C. Central America

1. Mexico - resistivity

2. Tikal, Guatemala

Proton magnetometer, resistivity Geohm, std seismograph

D. Historical Sites in North America

1. Independence Square, Phila. - Geohm & sonic prototype

2. Harpers Ferry, W. Va.

Geohm & std seismograph

3. Isle Royal, Lake Superior

Metal detector

~~A~~ Navan Fort, Armagh, N. Ireland
Proton magnetometer

~~F~~ Fort Louisbourg, Nova Scotia, Canada

Proton magnetometer, geohm, std seismograph & metal detector

~~E~~ Fort Loudon, Chambersburg, Pa.

Proton Magnetometer

~~G~~ Caleb Pusey House, Chester, Pa.

Geohm, metal detectors

(over)

7. Hagley Mills, Wilmington, Dela.
Proton magnetometer, metal detectors
8. Fort Lennox, Ile-aux-Noix, Quebec P., Canada
Rubidium magnetometer
Proton "
Cesium
St'd seismograph
Soiltest Terra Scout Seismograph
MacLaughlin Device?

Unreported

1. Long Island marl & peat bogs with
alternate layers of sand -
N.Y. State Archaeological Assoc. Cesium
2. Cornwall, England
Cesium & Oxford proton magnetometer

ASCA
Instrument Surveys Conducted

7/2/64 ✓

A. Italy

X 8/68

1. Sybaris -

Geohm

Proton magnetometer, Geohm, MacLaughlin
sonic prototype, & Seismograph (?)

See E. Ralph Report Summary

2. Tarquinia & Cervetri

See Linnington

3. Central America

1. _____, Mexico

Resistivity instrument made
in U.S.A. (

)
See Rainey & Spaulding Expedition

2. Tikal, Guatemala

Proton magnetometer, Geohm,
Seismograph.

Resistivity survey of
West Plaza indicated two
regions of changing resistivity
contours. Excavation revealed
that one represented shallow
depth to bedrock. The other deep

(over)

C. British Isles

1. Navan Fort, Armagh, N. Ireland
Proton magnetometers (both Oxford & ASCA)

collaboration
to B. White,
Joppe Univ.,
East, &
archaeologists
Ministry
Finance,
Ireland

(See Armagh Handbook, p. 17)

A bronze or iron age mound;
excavation, a training program
for U.S., Irish, & English
students.

Mike Tite (Oxford) made survey
over center of mound before
excavation - had rather
uncertain results.

F. Ralph later made lines &
grids in areas surrounding
the mound. Grid #5 (see sketch) made
over "NW entrance" indicated
only that the ~~soil~~ earth
there had not been
disturbed for many years -
regular pattern of magnetic
contours. Lines made
around nearby lake gave
both magnetic & non-
magnetic anomalies
(see sketch). A few tests
made with the "spillo"
indicated that (over)

non-magnetic anomaly ~~was~~
33 (line 13) represented a
deposit of sand & magnetic
anomaly # 129, solid rock at
0.5 meters deep. At anomaly
132 (line 12), a large animal
bone was found - anomaly
probably represents spot where
animal died in swamp.

2. Cornwall, England

B. Waites - Geohm +

Oxford proton magnetometer
with Mike Tite.

~~(See sketch of contours & excavation in ASCA file)~~

D. Historical Sites in North America

1. Independence Square, Philadelphia
(in collaboration with Dr. John Cotter)

Geohm & sonic prototype (too much city for magnetometer)

From test trenches made previously the locations of some walls are known. Surveys over these have, therefore, been made to test the effectiveness of the Geohm in various weather conditions, including snow, & w. the sonic prototype to ascertain whether any reflections from walls could be seen - none.

Site also convenient for instructing students in use of Geohm.

Site of U.S. Rifle Works

2. ¹ Harpers Ferry, West Virginia
Geolum & Seismograph

Surveys made by Hamilton Carson
in collaboration with Dr. John
Cotter & Mr. Edward ^{McM.} Larrabee.
(see Carson, Archaeometry).

The main find was a
turbine pit ^{at depth of 5 ft.} which produced
a pronounced low resistance
anomaly (due to collection of
water within its solid walls).
Its location was determined
also, but less precisely, with
the seismograph.

3. Isle Royal, Lake Superior
Metal Detector -

Survey made by Hamilton Carson
in collaboration with Dr. John Cotter

Object was to find sources
of copper ore which the
Indians used.

Result - map of the island
was made and various
"hot" spots (possible concentrations
of copper) were located
with the metal detector.

4. Fortress of Louisbourg, Nova Scotia, Canada

In collaboration w. chief archaeologist, Edward McM. Larrabee.

(See ~~attached~~ ~~report~~ Nov. 1, 1963 report of E. M. Larrabee - he saved me the trouble, and tourist brochure

Main objects of survey were to find graves in the chapel (to overcome the objection of the church to excavation) & tunnels under the embankments (Place d'Armes).

Objects of program there:

- 1) Excavation & recording
- 2) Restoration of Fort - to provide employment to unemployed miners & to train them to be masons.
- 3) Tourist attraction, eventually.

Proton magnetometer was most successful in the chapel in locating the graves (see fig.) & the geohm, was more successful in

✓

in the Place d'Armes - must
~~base~~ consist of much more
solid rock than surrounding
embankment. Results in
Feoreplein were confusing due
to recent bulldozer disturbances
& large deposits of mostly
modern iron.

(More figs. in ASCA file
if needed).

5. Fort Loudon, nr. Chambersburg, Pa.
In collaboration w. John Withhoff,
archaeologist, Harrisburg, Pa.
Proton magnetometer
Site of fort at gateway to
east. U.S. Nothing visible
remains.

Hoped to find indications
of former trenches &
embankments, & did
get consistent magnetic
disturbances in parallel
lines that probably
represented either ~~the~~
trench or embankment.

(Expect to do more elaborate
survey after Withhoff has done
test trench).

6. Caleb Pusey House, Chester, Pa.

In collaboration w. Dr. Allen Shick (amateur archaeologist).

This site chosen (at suggestion of Miss Henry) as a nearby one for instruction of students. Area was too close to city and dumps, etc. to use magnetometer. Geohm worked well in areas right around the old house in finding walls.

(See brochure about house and E. Ralph letter to Shick, Nov. 37, 1963.)

7. Hagley Museum, Wilmington, Del.

In collaboration w. Mr. James Ackerman.

This site chosen also (at suggestion of Mrs. Biggs) as a nearby one for instruction of students.

See brochure.

Region of powder wheels had too much iron (from previous explosions) for use of magnetometer, but with Metal Detectors, a large buried pipe and possible sections of buried grinding wheels were located.

At far end of park, region was found where magnetometer could be used and grids were made with it and with the Geohm.

Obtained rather vague indication of where underground brick or tile conduit was suspected and located several very magnetic spots -- probably remains of gear boxes, etc.

Carson made seismic survey in this same area in July, 1963

with inconclusive results.

1966 INSTRUMENT REQUESTS

Cs Magnetometer

Europe

Italy

Sybaris

Siris

Metapontum

Gravina

Sele

Veio

April-June

"

"

"

"

"

"

Greece

Helice

Katsaba, Crete

"

September

Israel

Mouth of Naaman River

Jelenie, Beth She'arim

June-July

"

British Isles

July

USA

W1 of Boston (Prof. Stephen Williams)

August, 1 week

Penna.

J. Witthoft Indian Sites

July-August

Other (Dr. Rainey)

Alaska--Kenneth M. Rae (?)

Proton Magnetometer

Peru. E.A.E. Beer

Mexico- Edw. L. Lindquist (Utah)

Geohms

Penna. Witthoft (?)

Metal Detector T-10-X

Oklahoma Tyler Bastian

(Ship late May)

June

People available for surveys

Hugh Bergh June (?)

Dept. of Geology

~~Princeton~~ Princeton Univ.

Princeton, N.J. 609-452-4101

201-297-1934 (home)

Ted Spackler summer (?)