



CENTRO UNIVERSITARIO EUROPEO  
PER I BENI CULTURALI

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In cooperation with:

Council of Europe;

Commission of the European Communities;

Comuni di Portoferraio, Piombino e Massa Marittima;

Associazione Intercomunale "Val di Cornia";

Soprintendenza Archeologica della Toscana;

Comitato "Etruria mineraria" dell'Istituto di Studi Etruschi ed Italici, Firenze;

Comité pour la Sidérurgie Ancienne de l'UISPP, affilié à l'UNESCO

European intensive course

**Archaeology and historical metallurgy of iron making**

Ravello - Island of Elba - Populonia

**May 16<sup>th</sup> – 27<sup>th</sup> 1989**

Topic: Nearly everywhere in the world it is possible to find iron ores which can be used for iron making in the direct process (bloomery). But for high-grade tools or weapons there is the need of a specialized smith, a smith with practical knowledge. Starting from these considerations, the aim of the course will be to give its participants some basic knowledges about modern methods of iron making and, at the same time, to show some of the most important excavations at ancient iron making sites. Practice in the use of microscope and smelting experiments are offered as well as excursions to sites of mineralogical, archaeological and metallurgical interest.

Part A. (Ravello)

Opening and introduction (*T. Hackens*, Director of the programmes, head of the group PACT numismatique metals)

Theme A 1: Technology, History and Archaeology of Iron: Mineralogy (Tanelli)

Metallurgy (*Sperl*)

History of iron making (Pleiner) Metals in the historical development (Camporeale)

Archaeology of the iron (*Delpino, Pelet, Cleere, Domergue, Magnusson, Gomöry, Toussaint, Nosek, Scott*)

History of iron in Campania (*Salvi, Barra, Sperl*) Industrial zones in antiquity (*Sperl*)

Medieval fortresses (Francovich) Industrial archaeology (Tognarini) Problems of conservation (Scott)

Theme A 2: Scientific Research Methods on Ancient Iron making: Seminar I : Fundamentals with examples of practice

Introduction, presentation of the speakers (Gerhard Sperl ) The preparation of the specimens for microscopical research; instruments for sectioning, grinding and polishing (W.Mazza) Practical exercises: preparation of specimens of historical interest (metal, slags, metallurgical ceramics)

Principles of mineralogical research on iron-smelting slags : theory, methods, tools and results (C. Reimann )

Nomenclature of iron : name, alloys, methods of forging and heat-treatment; the iron-carbon system, methods of research, trace elements of iron; slag inclusions : provenancesn (G. Sperl ) Seminar II : Practical exercises on microscopy : Theory of microscopy : specimens, preparation, the MeF 3 microscope (Reichert/Wien) and its possibilities; incident, transmitted light, polarisation, micriohardness, etc. (W. Mazza)

Equipment (*W. Pabisch*)

Exercises at the microscope (*Mazza, Reimann, Sperl*)

Part B. Island of Elba, Loc. Norsì

## Theme B1: The Situation at the Site

Mineralogical excursion: The deposits of iron ores and their accompanying minerals (*G. Tanelli*)

The archaeology of iron at the Island of Elba (*Pancrazi, Corretti, Brambilla*)

Archaeological excursion: Iron smelting sites of Etruscan, Roman and medieval times (*Pancrazi, Corretti, Brambilla*)

The structure of Etruscan iron smelting furnaces, materials used (*Voss*)

Collecting materials for the construction and the manipulation for practical iron making. Visit of a charcoal production site.

Optional visit to the museum of Portoferraio.

## Theme B2: Public Presentation of the History of Iron

Presentation of the project: The Tuscan Iron Park as the starting point of the European Iron Trail (*Sperl, Tognarini, Giannoni*)

2Excursion in Maremma -The Tuscan Iron Park : Piombino - Follonica - Valpiana - Massa - Suvereto - Campiglia - Populonia - Piombino.

## **Theme B3: Experimental Archaeology of Iron making**

Smelting experiments in a shaft furnace; using local iron ores, charcoal and bellows

Evening: Discussion of the results.

Smelting experiments in a domed furnace.

Evening: final discussion, further activities, publication of the results

Hackens

Coordinator: *G. Sperl*