

III.1.2. Eastern Area.....	31
III.1.2.1. Tertiary Basin of the Guadalquivir	
III.1.2.2. Sub-Betic Zone of the Alpine Domain	
III.2. MINERAL RESOURCES.....	31
III.2.1. Hesperian Massif.....	32
III.2.1.1. Ossa-Morena Zone	
III.2.1.1.1. Sierra Albarrana Domain	
III.2.1.1.2. Zafra-Alanís Domain	
III.2.1.1.3. Olivenza-Monesterio Domain	
III.2.1.1.4. Elvas -Cumbres Mayores Domain	
III.2.1.1.5. Barrancos -Hinojales Syncline	
III.2.1.1.6. Evora-Beja-Aracena Domain	
III.2.1.2. South Portuguese Zone	
III.2.1.2.1. Pulo de Lobo Formation	
III.2.1.2.2. Pyritic Belt	
III.2.1.2.2.1. Volcanic-Sedimentary Complex	
III.2.1.2.2.1.1. Rio Tinto Mineral Deposit	
III.2.1.2.2.2. Phyllitic-Quartzitic Formation	
III.2.1.2.3. Bajo Alentejo Flych Group	
III.2.1.2.3.1. Mértola Formation	
III.2.1.2.3.2. Mira Formation	
III.2.1.2.3.3. Bejeira Formation	
III.2.2. Eastern Area.....	41
III.2.2.1. Guadalquivir Depression	
III.2.2.2. Alpine Domain	
III.2.3. Synopsis of Silver Mineral Resources in the South West Iberian Pensinsula	
CHAPTER IV. ARCHAEOLOGICAL REGISTER AND ANALYSIS: BASES FOR THE ARCHAEO-METALLURGICAL INVESTIGATION	44
IV.1. MINING ACTIVITY.....	44
IV.1.1. Surveyed Areas.....	44
IV.1.1.1. Sierra de Aracena-Northern Sierra de Sevilla	
IV.1.1.2. Aznalcóllar-Rio Corumbel-Madroño-El Castillo de las Guardas	
IV.1.1.3. Other Surveyed Mines in the South Portuguese Zone	
IV.1.1.4. Sub-Betic Area	
IV.1.2. Catalogue of the Mineral Deposits with Evidence of Prehistoric Exploitation in the	
South West Iberian Pensinsula.....	111
IV.2. METALLURGICAL ACTIVITY	143
IV.2.1. Chalcolithic	143
IV.2.2. Middle Bronze Age	173
IV.2.3. Pre-Orientalizing Late Bronze Age	194
IV.2.4. Orientalizing Period.....	194
CHAPTER V. ISOTOPIC CHARACTERISATION OF THE SOUTH WEST IBERIAN PENINSULA.....	218
V.1. ISOTOPIC CHARACTERISATION OF THE OREBODIES OF THE SOUTH WEST IBERIAN PENINSULA.....	218
V.1.1. Levels of Internal and Regional Comparison: Mineral Deposits of the South West Iberian Pensinsula	218
V.1.2. Level of General Comparison: Mineral Deposits of the South-Central and the South-East of the Iberian Pensinsula and of the Mediterranean.....	221
V.2. ISOTOPIC STUDY OF THE ARCHAOMETALLURGICAL SAMPLES	

FROM THE SOUTH WEST OF THE IBERIAN PENINSULA	239
V.2.1. Chalcolithic	239
V.2.2. Middle Bronze Age	242
V.2.3. Pre-Orientalizing Late Bronze Age	249
V.2.4. Orientalizing Period.....	250
CHAPTER VI. MINING AND METALLURGICAL TECHNOLOGY.....	259
VI.1. MINING TECHNOLOGY.....	259
VI.1.1. Formation of the Mineral Deposits.....	259
VI.1.2. The Non-metallurgical Use of Minerals	260
VI.1.3. The Technological Basis: Antecedents of Metallic Mining	262
VI.1.4. Non-metallic Mining in the Iberian Peninsula	264
VI.1.5. Metallic Mining in Europe and the Near East.....	266
VI.1.6. Metallic Mining in the Iberian Peninsula.....	272
VI.1.7. Metallic Mining in the South West of the Iberian Peninsula	274
VI.1.7.1. Prehistoric Ore Deposits Surveying	
VI.1.7.2. Mineral Species Exploited	
VI.1.7.3. Mining Tools	
VI.1.7.3.1. Stone Hammers	
VI.1.7.3.1.1. Typology of the Stone Mining Hammers in the South West Iberian Peninsula	
VI.1.7.3.2. Stone Axes	
VI.1.7.3.3. Metallic Mining Tools	
VI.1.7.3.4. Other Mining Tools	
VI.1.7.4. Typology of Mine Workings	
VI.1.7.5. Mining Accidents	
VI.2. METALLURGICAL TECHNOLOGY	291
VI.2.1. <u>Chalcolithic</u>	292
VI.2.1.1. Ore Concentration	
VI.2.1.1.1. Mortars: Chronology and Typology	
VI.2.1.1.2. Ore Concentration in the Chalcolithic	
VI.2.1.2. Transformation and Production Activities	
VI.2.1.2.1. Furnaces, <i>Vase-oven</i> and Crucibles	
VI.2.1.2.2. Tuyeres	
VI.2.1.2.3. Slags	
VI.2.1.2.4. Moulds	
VI.2.1.3. Metallic objects	
VI.2.1.3.1. Copper-Base Objects	
VI.2.1.3.1.1. Arrowheads	
VI.2.1.3.1.2. Javelins	
VI.2.1.3.1.3. Axes	
VI.2.1.3.1.4. Daggers and Knives	
VI.2.1.3.1.5. Awls, Spatulas and Chisels	
VI.2.1.3.1.6. Saws and Sickles	
VI.2.1.3.1.7. Halberds	
VI.2.1.3.1.8. Various	
VI.2.1.3.2. Native Copper	
VI. 2.1.3.3. Arsenical Copper	
VI.2.1.3.4. Iron in Copper Artefacts	
VI.2.1.3.5. Gold Objects	
VI.2.1.3.6. Iron in the Chalcolithic?	
VI.2.2. Middle Bronze Age	329
VI.2.2.1. Ore Concentration	
VI.2.2.2. Transformation and Production Activities	

VI.2.2.2.1. Furnaces, <i>Vase-oven</i> and Crucibles	
VI.2.2.2.2. Tuyeres	
VI.2.2.2.3. Slags	
VI.2.2.2.4. Moulds	
VI.2.2.3. Metallic Objects	
VI.2.2.3.1. Copper-Base Metallic Objects	
VI.2.2.3.1.1. Arrowheads	
VI.2.2.3.1.2. Axes	
VI.2.2.3.1.3. Daggers, Knives and Rapiers/Swords	
VI.2.2.3.1.4. Awls and Chisels	
VI.2.2.3.1.5. Saws	
VI.2.2.3.1.6. Halberds	
VI.2.2.3.1.7. Various	
VI.2.2.3.2. Gold Objects	
VI.2.2.3.3. Iron in the Middle Bronze Age?	
VI.2.2.3.4. Silver in the Middle Bronze Age	
VI.2.2.3.4.1. Silver Metallurgy: General Considerations	
VI.2.2.3.4.2. Distinction between Cupelled and Non-Cupelled Silver	
VI.2.2.3.4.3. Middle Bronze Age Silver Metallurgy in South West Iberian Peninsula	
VI.2.2.3.4.4. Silver Objects	
VI.2.3. Pre-Orientalizing Late Bronze Age	349
VI.2.3.1. Ore Concentration	
VI.2.3.2. Transformation and Production Activities	
VI.2.3.2.1. Furnaces, <i>Vase-ovens</i> and Crucibles	
VI.2.3.2.2. Tuyeres	
VI.2.3.2.3. Slags	
VI.2.3.3. Metallic objects	
VI.2.3.3.1. Copper-Base Objects	
VI.2.3.3.2. Gold Objects	
VI.2.3.3.3. Iron objects	
VI.2.4. Orientalizing Period.....	356
VI.2.4.1. Copper Metallurgy	
VI.2.4.1.1. Transformation and Production Activities	
VI.2.4.1.2. Copper-Base Objects	
VI.2.4.2. Silver Metallurgy	
VI.2.4.2.1. Ore Concentration	
VI.2.4.2.2. Transformation and Production Activities	
VI.2.4.2.2.1. Furnaces	
VI.2.4.2.2.2. Tuyeres	
VI.2.4.2.2.3. Silver Slags	
VI.2.4.2.2.3.1. Tapped Slags	
VI.2.4.2.2.3.2. "Free Silica" Slags	
VI.2.4.2.2.4. Slagged Pottery	
VI.2.4.2.2.5. Colanders	
VI.2.4.2.2.6. Cupels	
VI.2.4.2.2.7. Litharge	
VI.2.4.2.2.8. Lead Drops	
VI.2.4.2.2.9. Lime	
VI.2.4.2.3. Silver Objects	
VI.2.4.3. Gold Objects	
VI.2.4.4. Iron in the Orientalizing Period	

CHAPTER VII. EVALUATION AND DYNAMICS OF MINING AND METALLURGY DURING THE RECENT PREHISTORY IN THE SOUTH WEST IBERIAN PENINSULA	372
VII.1. MINERAL RESOURCES	372
VII.2. ISOTOPIC CHARACTERISATION OF ORE DEPOSITS.....	373
VII.3. NEOLITHIC-CHALCOLITHIC TRANSITION.....	374
VII.4. CHALCOLITHIC MINING AND METALLURGICAL TECHNOLOGY	376
VII.5. MIDDLE BRONZE AGE MINING AND METALLURGICAL TECHNOLOGY.....	383
VII.6. PRE-ORIENTALIZING LATE BRONZE AGE MINING AND METALLURGICAL TECHNOLOGY.....	387
VII.7. ORIENTALIZING PERIOD MINING AND METALLURGICAL TECHNOLOGY.....	391
CHAPTER VIII. BIBLIOGRAPHY.....	396