The Importance of Scaglia Rossa Chert as a Raw Material for Human Populations in Monte San Vicino, Italy throughout Italian Prehistory

Erin Elizabeth Falzareno

Department of Anthropology and Archaeology
Washington & Lee University
Lexington, VA 24450

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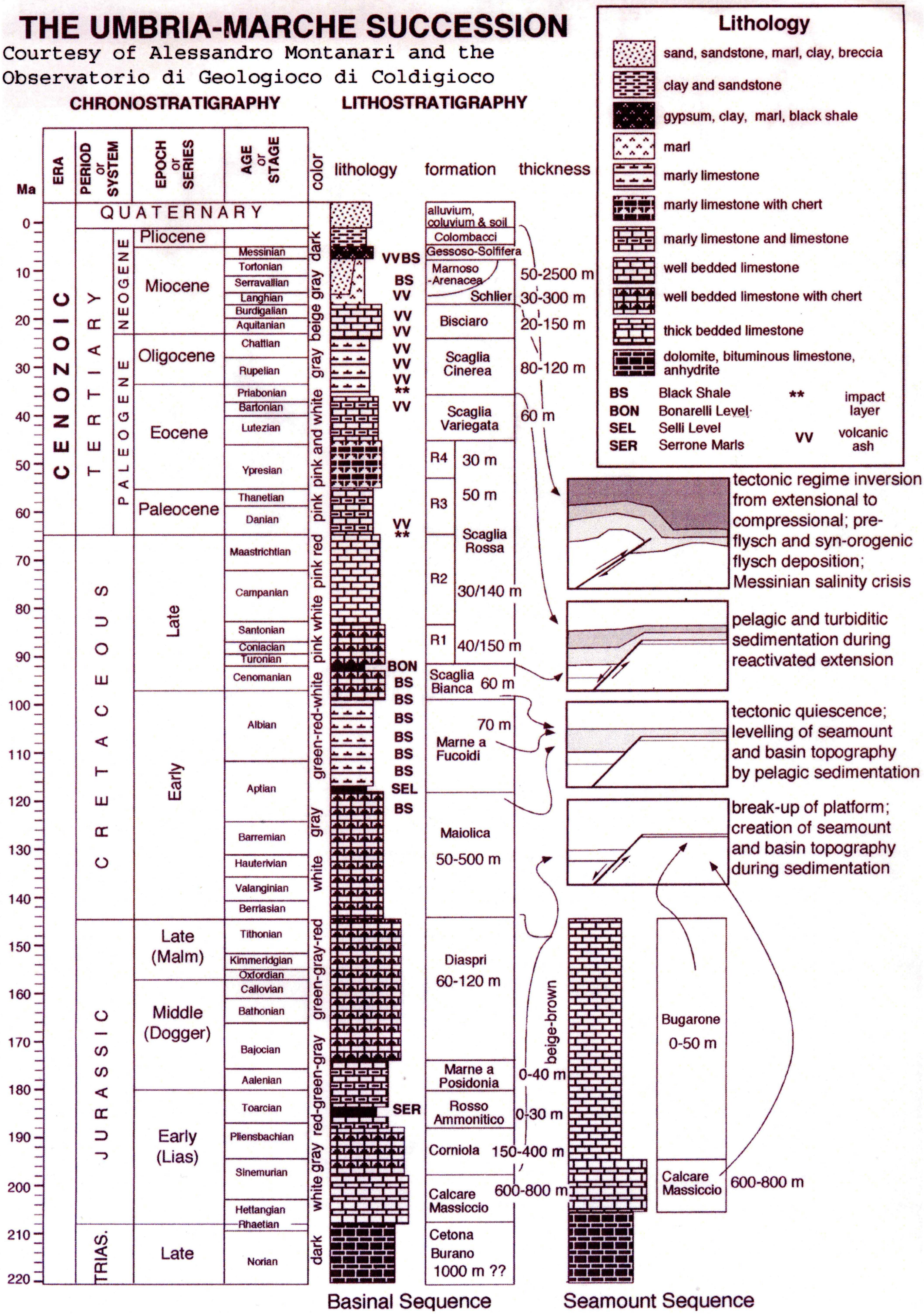
THE UMBRIA-MARCHE SUCCESSION
Courtesy of Alessandro Montanari and the
Observatorio di Geologioco di Coldigioco
CHRONOSTRATIGRAPHY
LITHOSTRATIGRAPHY
Ma
ERA
PERIOD or SYSTEM
EPOCH or SERIES
AGE or STAGE
color
lithology
formation
thickness
QUATERNARY
CENOZOIC
TERTIARY
NEOGENE
PALEOGENE
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Messinian
Tortonian
Serravallian
Langhian
Burdigalian
Aquitanian
Chattian
Rupelian
Priabonian
Bartonian
Lutezian
Ypresian
Thanetian
Danian
CRETACEOUS
Late
Early
Maastrichtian
Campanian
Santonian
Coniacian
Turonian
Cenomanian
Albian
Aptian
Barremian
Hauterivian
Valanginian
Berriasian
JURASSIC
Late (Malm)
Middle (Dogger)
Early (Lias)
Tithonian
Kimmeridgian
Oxfordian
Callovian
Bathonian
Bajocian
Aalenian
Toarcian
Pliensbachian
Sinemurian
Hettangian
Rhaetian
TRIAS.
Late
Norian
dark
gray
beige
gray
pink and white
pink
pink red
pink white
pink white
green-red-white
gray
white
green-gray-red
green-gray
red-green-gray
white gray
dark
VVBS
BS
VV
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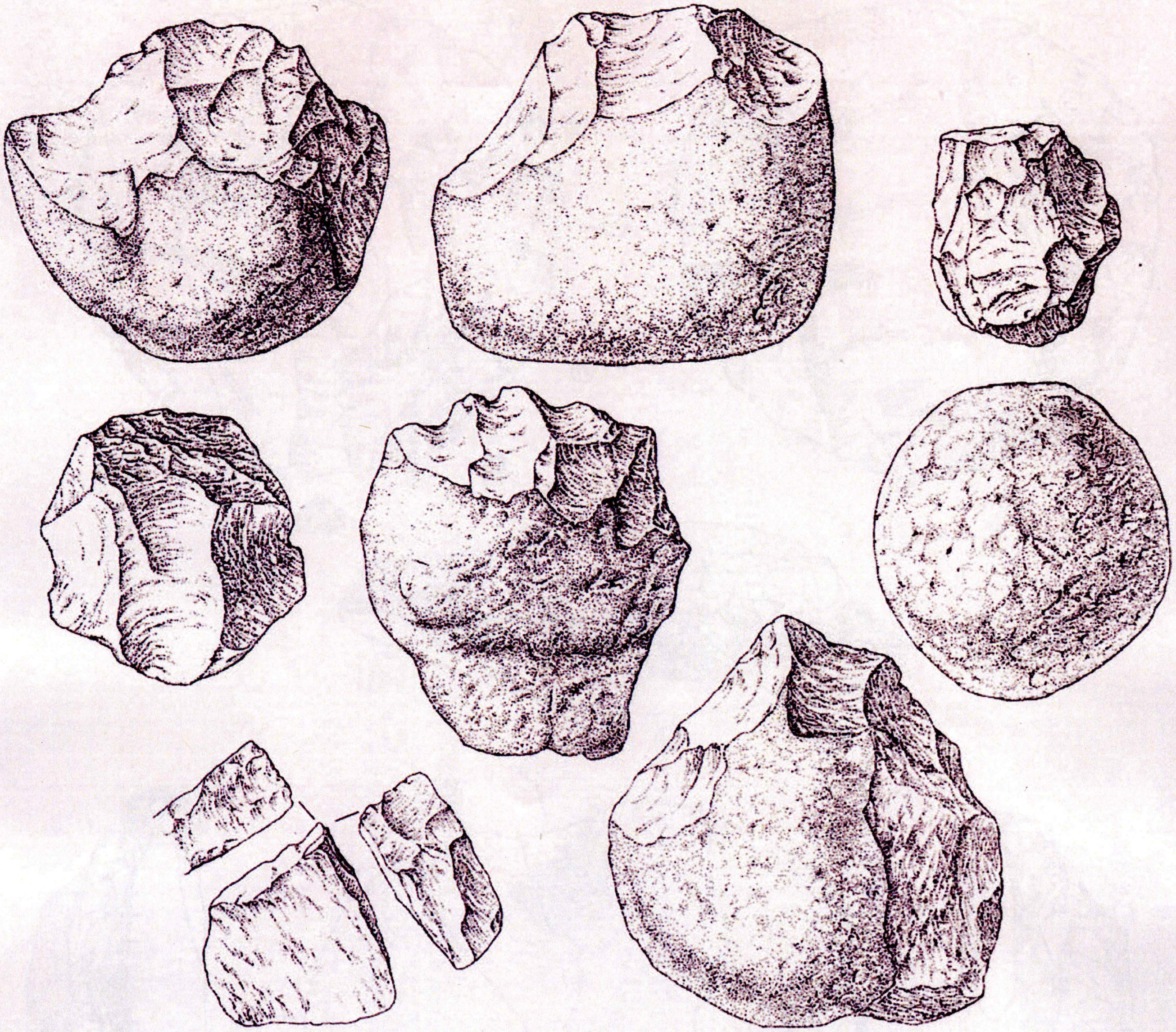
VV
VV
VV
**
VV
VV
**
BON
BS
BS
BS
BS
BS
BS
SEL
BS
SER
alluvium, coluvium & soil
Colombacci
Gessoso-Solfifera
Marnoso -Arenacea
Schlier
Bisciaro
Scaglia Cinerea
Scaglia Variegata
R4
R3
R2
R1
Scaglia Rossa
Scaglia Bianca
Marne a Fucoidi
Maiolica
Diaspri
Marne a Posidonia
Rosso Ammonitico
Corniola
Calcare Massiccio
Cetona Burano
50-2500 m
30-300 m
20-150 m
80-120 m
60 m
30 m
50 m
30/140 m
40/150 m
60 m
70 m
50-500 m
60-120 m
0-40 m
0-30 m
150-400 m
600-800 m
1000 m ??
beige-brown
Bugarone
0-50 m
Calcare Massiccio
600-800 m
Lithology
sand, sandstone, marl, clay, breccia
clay and sandstone
gypsum, clay, marl, black shale
marl
marly limestone
marly limestone with chert
marly limestone and limestone
well bedded limestone
well bedded limestone with chert
thick bedded limestone
dolomite, bituminous limestone, anhydrite
BS Black Shale
BON Bonarelli Level
SEL Selli Level
SER Serrone Marls
** impact layer
VV volcanic ash
tectonic regime inversion from extensional to compressional; pre-flysch and syn-orogenic flysch deposition; Messinian salinity crisis
pelagic and turbiditic sedimentation during reactivated extension
tectonic quiescence; levelling of seamount and basin topography by pelagic sedimentation
break-up of platform; creation of seamount and basin topography during sedimentation
Basinal Sequence
Seamount Sequence

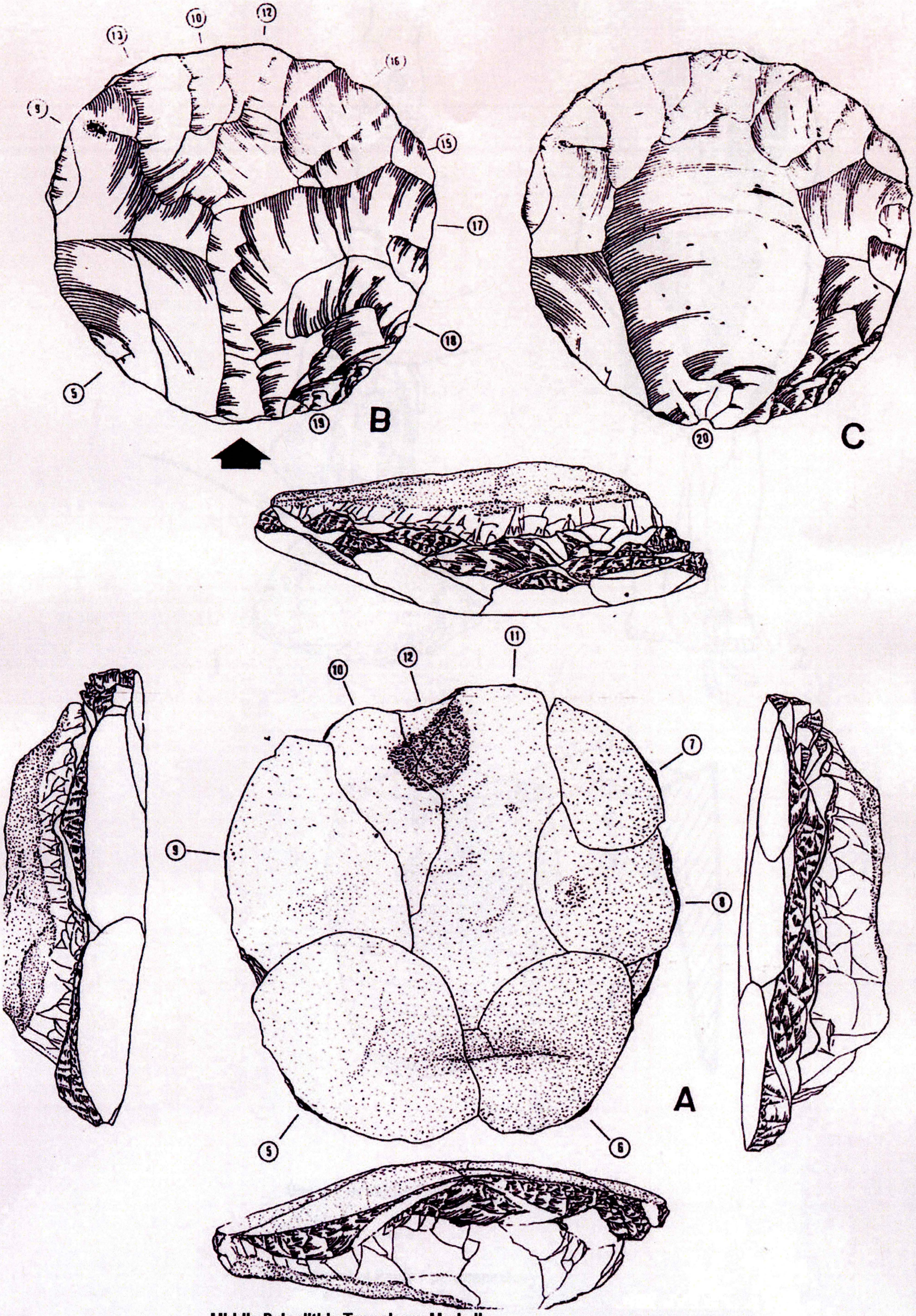
Figure 1



Lower Paleolithic Technology- Mode I

Figure 2

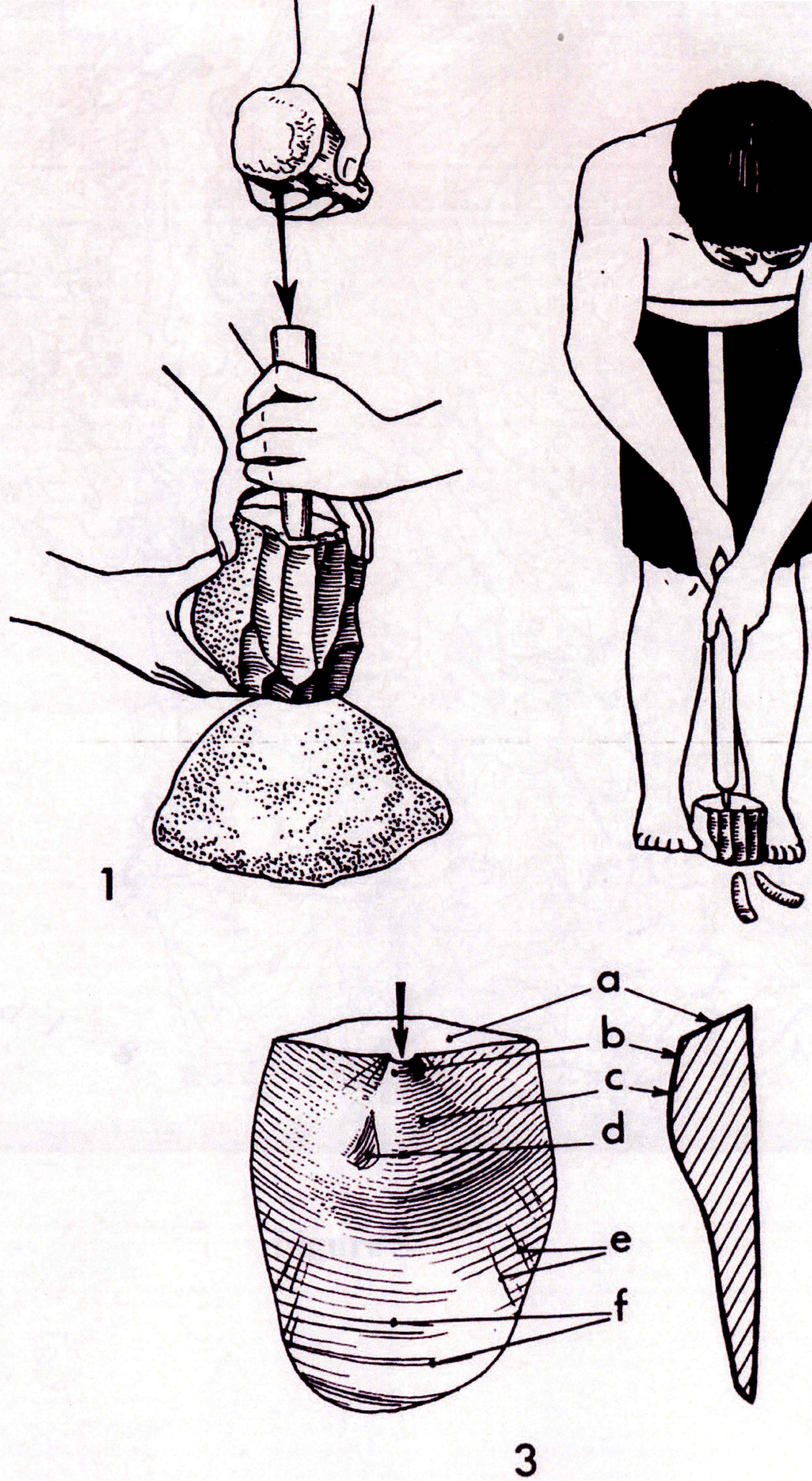
Courtesy of Paolo Appignanesi



Middle Paleolithic Tecnology- Mode II

Figure 3

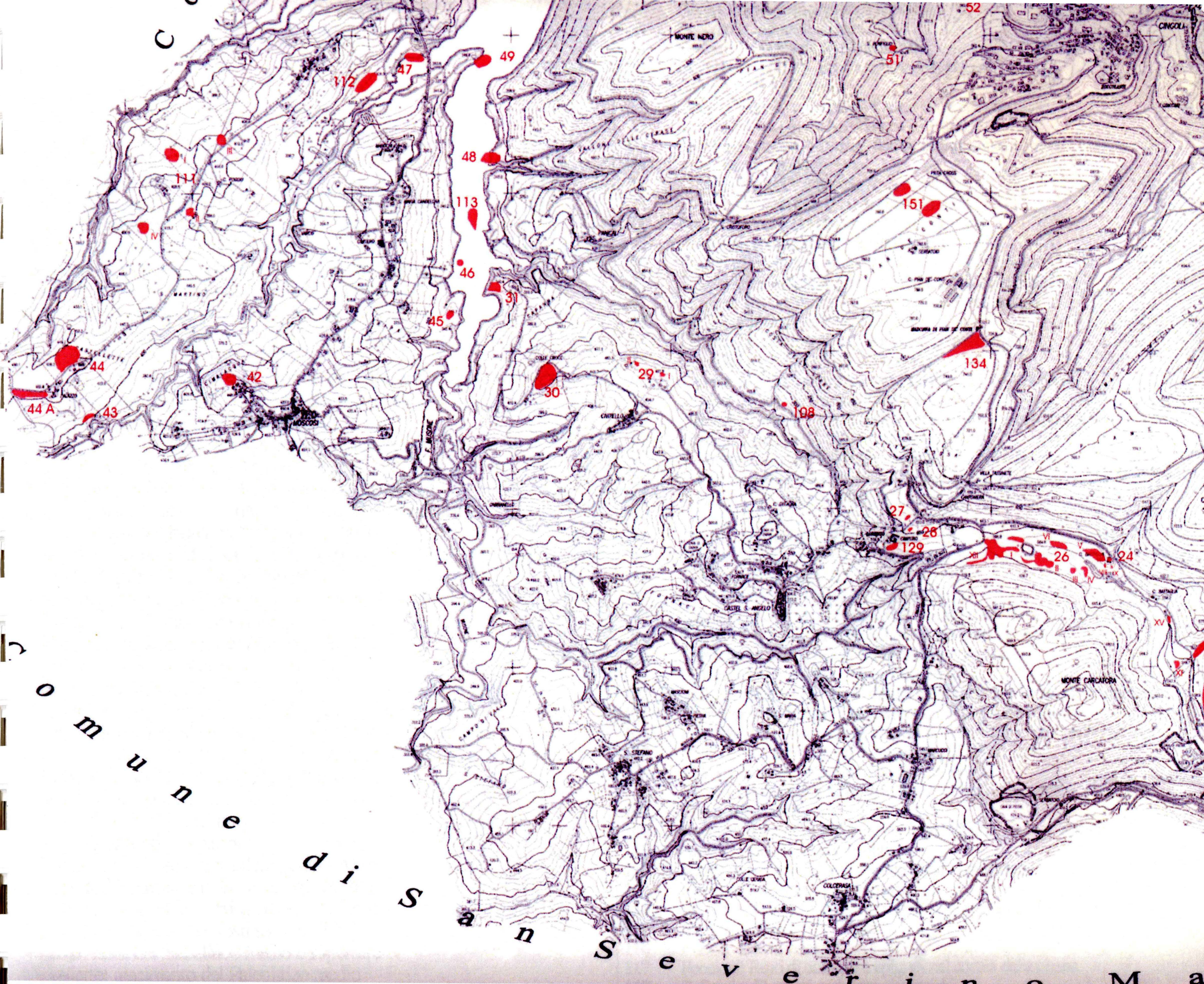
Courtesy of Paolo Appignanesi



Upper Paleolithic Technology

Figure 4

Courtesy of Paolo Appignanesi


Comune di San Severino Ma
MONTE NERO
CINGOLI
CASTEL S. ANGELO
MONTE CARCAFORA
COLCERASA
44 A
44
43
42
111
112
47
49
48
113
46
31
45
30
29
108
51
52
151
134
27
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129
26
24

Figure 5

Cingoli, centro storico: resti romani
Borgo San Lorenzo: centro urbano romano
Cerquetana: insediamento neolitico e resti romani
Monte Alto: ceramica e litica dell'età del Bronzo
Collicello: resti medievali
Valle di Castro: litica e ceramica in strato del Neolitico e Bronzo finale
Piana dei Saraceni: villa romana e resti neolitici
Cambrione: litica e ceramica neolitica
Grottaccia: ripostiglio monetale e insediamento romano
Masciotto I: insediamento del Neolitico superiore
Masciotto II: insediamento del Neolitico superiore
Rio: litica e ceramica del Neolitico e dell'età del Bronzo
Saraceno: litica del Paleolitico medio
Madonna dell'Ospedale: sito stratificato del Paleolitico superiore
Castellano: resti medievali e industria litica protostorica
Fosso cupo: ceramica del Bronzo recente
Romitorio di S. Angelo: resti medievali e litica del Neolitico
Monte S. Angelo: litica neolitica e ripari sotto roccia (distrutti)
Marconessa: industria litica dal Paleolitico al Neolitico
Cima di Mastro Luca: litica del Paleolitico inferiore e medio
Valle di Magliano: industria litica del Neolitico
Botontano: ceramica dell'età del Ferro (necropoli?)
Valle di Magliano: insediamenti neolitici
S. Lorenzo I: litica del Paleolitico medio e dell'Eneolitico
S. Lorenzo: industria litica neolitica
Civitello: ceramica e litica dell'età del Bronzo
Colle Croce: insediamento medievale
Capanna: industria litica dell'Eneolitico
A' Castella: strutture medievali e litica paleolitica e neolitica
Cocilova: litica del Paleolitico medio e dell'età del Bronzo
Condotto I: litica paleolitica e neolitica, ceramica del Bronzo e romana
Condotto II: industria e ceramica neolitica
Sassone I: manufatti neolitici
Sassone II: manufatti neolitici
Colognola: castello medievale
Borghetto A: industria litica dell'età del Bronzo
Borghetto B: ceramica e litica dell'età del Bronzo
Borghetto C: ceramica e litica dell'età del Bronzo
Castellano - Cimalacqua: resti medievali
Palazzo: litica del paleolitico medio e superiore
Castellette: giacimento del Paleolitico medio
Piano di Fonte Marcosa: insediamento dell'età del Bronzo
Fornaci: ceramica e litica dell'età del Bronzo (sommerso)
Mulinetto: ceramica e litica dell'età del Bronzo (sommerso)
Caprareccia: ceramica e litica dell'età del Bronzo (sommerso)
Castellano: industria paleolitica
Castreccioni: castello medievale
S. Bonfiglio: industria litica neolitica
Cerquatti: industria litica neolitica
Colle di S. Esuperanzio: giacimento eneolitico
Marzo: industria litica neolitica
Codardone: ceramica e industria litica dell'età del Bronzo
S. Biagio: insediamento dell'età del Bronzo e del Ferro
Castellano (Bachero): insediamento dell'età del Bronzo
Campilunghi: industria litica e ceramica neolitica
S. Vittore: insediamento e necropoli romani
Porcareccia: necropoli romana
Rangore I: industria litica neolitica
Rangore II: industria litica neolitica
Rangore III: industria litica neolitica
Marcianello: industria litica neolitica
Rangore IV: industria litica neolitica
Caprile (Bachero): insediamento dell'età del Bronzo

67 Piana Carloni: industria litica neolitica
68 Bachero I: industria litica neolitica
69 Bachero II: industria litica neolitica
70 Incoronati: industria litica e ceramica neolitica
71 Canonica dei 4 Coronati:
72 Cerreto Monnece: industria litica e ceramica neolitica
73 Cerreto Monnece: industria litica e ceramica neolitica
74 Cerreto Monnece: industria litica e ceramica neolitica
75 Monnece: ceramica romana
76 Colle di Collicelli: industria litica neolitica
77 Colonnette: industria litica di età indefinita
78 Petto Vallone: industria litica di età indefinita
79 Petto Vallone: ceramica e laterizi romani
80 S. Obrizio: frammenti architettonici e rilievo medievali
81 Calandrione: industria litica e ceramica di età indefinita
82 Troviggiano: industria litica e ceramica di età indefinita
83 Lioni: industria litica di età indefinita
84 Torrone D: industria litica neolitica e protostorica
85 Torrone B: tomba dell'età del Ferro
86 Torrone C: Olla medievale scavata contenuta in pozzetto
87 Torrone A: strutture edilizie romane
88 Pian della Pieve: materiale edile e fittile di età romana repubblicana
89 Saltregna: Elementi fittili di pavimento in cotto
90 S. Faustino: Luogo dell'antico castello, non più esistente
91 S. Faustino: Industria neolitica e ceramica d'impasto dell'età del Ferro
92 Briacu I: Ruderi della chiesa di S. Bartolomeo
93 Briacu II: Frammenti ceramici medievali
94 Crevalcore: Industria litica neolitica e altra fluitata forse paleolitica
95 Cervara: Industria litica Eneolitica, ceramica dell'età del Bronzo e del Ferro
96 Valcarecce: Industria litica neolitica
97 Mulino nuovo: Industria litica eneolitica
98 Canonica: Industria litica neolitica e ceramica dell'età del Bronzo
99 Bachero III: Industria litica del Neolitico o del Bronzo
100 Quintaparte: Olla medievale rinvenuta in una buca
101 Castellano: Frammento di muro in laterizi
102 Valle Canonica: Frammenti di tubi di piombo di un acquedotto romano
103 Tavignano: industria litica e ceramica del Neolitico superiore
104 Pian Martino: Pavimento di terracotta di un edificio produttivo romano
105 Villa Torre: Pavimento in cotto spicato di età romana
106 Villa Castiglioni: Strutture murarie con laterizi
107 Piane di Mastro Luca: industrie litiche del paleolitico inferiore e medio
108 Costa delle Serre:
109 Ponte della Petrella: Industrie litiche neolitiche, sito sommerso
111 Azzoni: Industrie litiche neolitiche
112 Marochi: Industrie litiche neolitiche, sito sommerso
113 Fornace II: laterizi, sito sommerso
114 Baracche: Deposito stratificato dell'Epigravettiano (Pal. Sup.)
115 Campana: chiesa di S. Floriano
116 Roccio: industrie litiche
117 Poccioni: Resti di colonne e epigrafi nel cortile della chiesa
118 S. Sergio: Elementi architettonici antichi
119 Rio, casa colonica n° 19: Elementi architettonici antichi
122 S. Anastasio: Chiesa diruta e frammenti di decorazione architettonica
123 Case la Madonna: Frammenti di decorazione architettonica
124 Santa Lucia: Frammenti di decorazione architettonica
125 Villa Strada: Frammenti di decorazione architettonica
126 Pian della castagna: Frammenti di decorazione architettonica
127 Villa Pozzo: Frammenti di decorazione architettonica
128 Palazzo Raffaelli: industrie litiche del Paleolitico medio
129 S. Lorenzo III: industrie litiche del Paleolitico medio
130 S. Vitale: Chiesa con decorazioni architettoniche
131 Cervidone: Industria litica di età non definita
133 Scopitti (Valle di Magliano):
134 Madonna di Pian de' Conti: industrie litiche del paleolitico inferiore e medio
135 Cima delle Piane: industrie litiche neolitiche
136 Lebboreto: industrie litiche
137 S. Flaviano: chiesa e frammenti di decorazione architettonica
138 Gabbiano: Ceramica romana
139 Pian della castagna: Industrie litiche del Paleolitico medio
140 Paterno:
142 Piantate: Materiale di epoca romana
144 Palazzo Castiglioni: Materiale di epoca romana
146 Torrone: Industrie litiche del Paleolitico medio
149 Masciotto III: Tracce di insediamento dell'età del Bronzo
151 Pian de' Conti: industrie litiche del paleolitico inferiore e medio

Figure 6

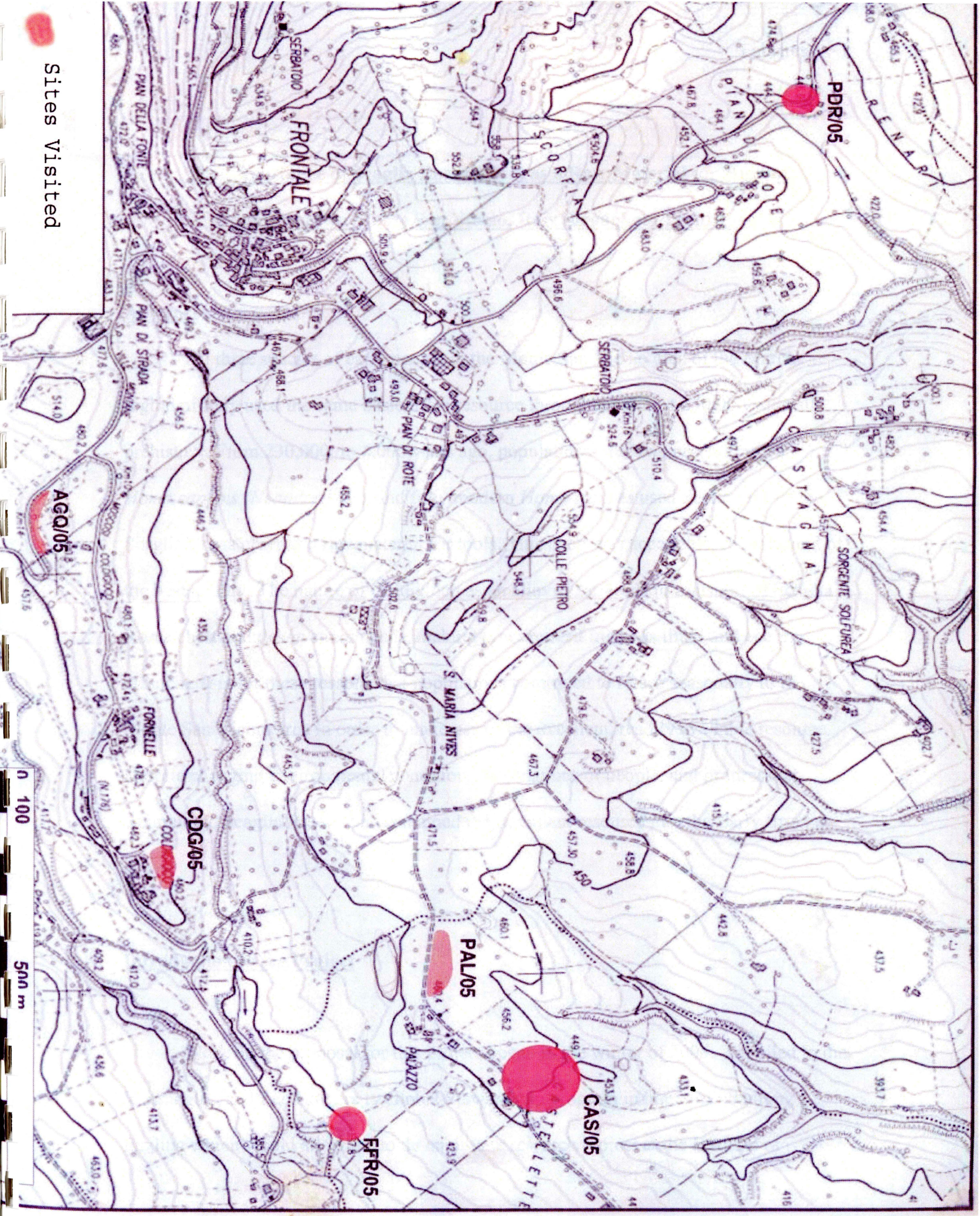

Sites Visited
PDR/05
AGQ/05
CDG/05
PAL/05
CAS/05
FFR/05
FRONTALE
SERBATOIO
PIAN DELLA FONTE
PIAN DI STRADA
PIAN DI ROTE
COLLE PIETRO
S. MARIA NIVES
SORGENTE SOLFUREA
FORNELLE
PALAZZO
0 100 500 m

Figure 7

The Importance of Scaglia Rossa Chert as a Raw Material for Human Populations in Monte San Vicino, Italy throughout Prehistory

Abstract

All three species of early people in the Monte San Vicino area of the Marche region of Italy used the same basic lithic resource throughout almost 250,000 years of prehistory. From 230,000 to 4,000 years ago, populations of *Homo erectus*, archaic *Homo sapiens (Neanderthals*), and fully modern *Homo sapiens* used Section R1 of the Scaglia Rossa chert as a raw material for tools. This chert was accessible, reliable, and of the best quality. The nature of Coldigioco as an alluvial fan leads to transport of Scaglia Rossa chert nodules in stream beds, making procurement methods time- and energy-efficient. It is for these reasons that populations continued to return seasonally to the Monte San Vicino area in order to make use of the excellent, readily available resource. Despite changing environmental conditions, populations of people, and progressing technology, Scaglia Rossa chert remained the dominant resource into the Early Bronze age.

Introduction to the Project

Work on the proposal for this project began in the winter of 2005. I applied to the Washington and Lee University Global Stewardship program in hopes of obtaining funding which would allow me to do an on-site research project at the Institute of

Geological Research in Coldigioco, Italy. I had lived in Italy on two previous occasions and had a fairly accurate command of the language, as well as a tremendous appreciation of the Italian people. When I learned of the relationship between the Institute and Washington and Lee, I was drawn to the possibility of doing relevant research in my field (geology and anthropology) at this location. I envisioned this experience as a way to return something of value (my research) to the country which I felt had been so hospitable to me.

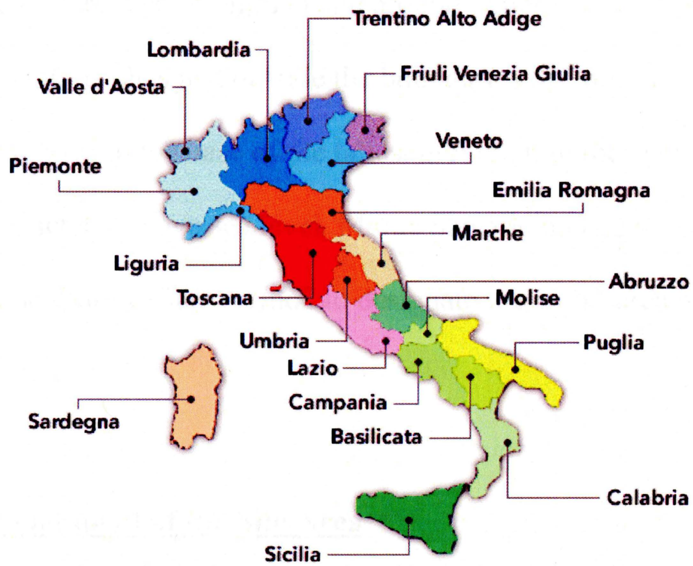
My primary contact (through the geology department at Washington and Lee) was Alessandro Montanari, head of the observatory. He was very informative in detailing the types of research projects going on in the immediate area. During our discussion of possible independent research proposals, we were able to zero in on one which might highlight the number of prehistoric sites in the area. Mr. Montanari was able to direct me towards the utilization of local resources which would be invaluable in both the creation of my proposal and the formulation of my project. As a teacher and owner of the observatory, he offered his own guidance as well as access to extensive knowledge of the geologic history in the area gleaned from the many research projects coordinated at the observatory. He also proposed utilizing the expertise of his friend Paolo Appignanesi, the curator of the archaeological museum of Cingoli, for consultation on the prehistoric peoples and their lithics.

The resulting proposal, ultimately accepted, dovetailed my two primary academic interest areas of geology and anthropology in a broad geo-archeological investigation. I am grateful that both the Global Stewardship Program and Washington & Lee Geology Department provided the financial support needed to realize this research. In June of

2005, upon arrival at the observatory, the process of narrowing the scope of the project began immediately. After several days of exploring the site areas and gathering as much general information as possible it became apparent that the actual prehistoric history of the area was not as well documented as one would have thought. Le Marche, the region in which the observatory is located has not been heavily studied to date. This is quite possibly partially due to the fact that most of the areas under investigation in Le Marche happen still to be under cultivation as well. These lands are covered with working farms, crop fields, and residences. They are not pristine areas set aside or protected for the study of a prehistoric people. Interest in the prehistory of Italy has been primarily focused on other geographic areas of the country. For this reason, one of our goals immediately became to establish a cultural history of the sparsely studied area (figuring out who was where and when).

My research, based in part on the actual field work completed in Italy, and in part on extensive research at the institute and continued at home has resulted in the paper which follows. My hope is that it contributes to the understanding of the earliest peoples to populate this sector of Italy specifically, but also to the general knowledge we have about prehistory behavioral patterns.

Introduction to the Site Area



My research area was located in the Central Mediterranean section of Europe, more specifically the Marche region of Italy. Le Marche lies in central eastern Italy bordering the Adriatic and including the famous city of Ancona. Just north of this region lies the Abruzzo region, and bordering the Marche border is the Po River Valley. Many times the two are documented as one (the Marche/Abruzzo region) due to similarities in location and environment. Le Marche is a mix of environmental settings, from the sea coast to lowlands all the way to the top of the Central Apennines.

In the region of Le Marche lie four provinces. The Observatory from which I was based lay in the Cingoli region of the Macerata Province. The Cingoli region is situated at the base of the Apennines amongst gently rolling hills and inclining alluvial fans. The city of Cingoli is the major point of reference on area maps; it is only fifteen miles away from our "base camp" and site locations. It is more difficult to locate, both on maps and while traveling, than Moscosi and Frontale, the nearest villages just less than three miles distance away. The Observatory of Geology at Coldigioco (Observatorio di Geologia di Coldigioco) was where the research was compiled and around which the sites are located. The circumference of our work reaches just outside the boundaries of Frontale. The entire circumference is positioned at the base of the tallest mountain in the area. Reaching just over 1000m (meters) above sea level, Monte San Vicino is our point of reference. I will use the name "Monte San Vicino" to designate the entire area of the sites of interest.

Geologic History and Development of the Site Area

Before examining human use of lithic resources in the Monte San Vicino area, I include a very thorough examination of the geologic history of the area because it is important to understand the formation of the area and the geological aspects of a population's entire natural environment. The following section begins with tectonic history and ends in current surface, geologic processes. Both topics are vital to the formation of available resources to human groups. I include an extensive section on the properties of chert in the area to demonstrate the overall high quality resource of the Scaglia Rossa chert compared to all others in the region.

Also, the foundation for the project was based in a geo-archaeological understanding of the prehistory. The goal of geo-archaeology is to utilize the understanding of the earth science processes to aid in the archaeological understanding of the area. The chert sources for prehistoric lithics were formed millions of years ago and based on their formation, resulted in a high level of selectivity bias for the Scaglia Rossa. Minor changes in the geologic prehistory of the area directly affect aspects of the human prehistory of the area. As Tim Church commented in his book Lithic Resource Studies: a Sourcebook for Archaeologists, "Any project that does not include a thorough, if not exhaustive, review of the pertinent geological literature of the area should be viewed with suspicion" (1994:78).

Tectonic Evolution and Formation of the Apennines

The geologic history of the Monte San Vicino area is complex. About 200 ma (million years ago), the super continent of Pangea – comprising all of the current day continents – began to break apart as tectonic plates shifted away from each other after a long period of unity. A giant ocean, called the Tethys, was present during the time of Pangea and continued to change shape as the plates shifted. A portion of it was to become the Mediterranean Sea. The Ligurian Ocean, a branch of the Tethys, was where the sediments pertinent to the lithic industry of interest in the current study began to collect and lithify on the abyssal plain of the ocean floor. When Pangea initially started the break up, it separated into two main continents, Laurasia (Eurasia and North America) and Gondwanaland (Latin America, India, Australia, Antarctica, and Africa). Plates all over the globe were subducted as they pushed away from other plates and formed convergent or transform boundaries as they pushed upwards against other plates. The area of our concentration was submerged underwater as a part of the African plate, on Gondwanaland, called Adria. Adria was in the process of being stretched as its position was in the middle of the spreading zone between Gondwanaland and Laurasia (Montanari 2002:15-18).

About 150 ma, the plates stopped diverging and consequently thinned out the fragment of Adria, the African and European plates began pushing against each other. As they converged about 90 ma, they closed the Ligurian branch of the Tethys Ocean (Sverdrup 2006: 69-70). The compressive forces eventually forced the smaller plates like Adria to the forefront of the collision, to be uplifted and thrusted onto land. This led to the formation of the Apennines.

The collision forming the Apennines, called the Apennine Orogeny, took place over a long stretch of time. Tectonic pressures acted for more than 80 million years to thrust each crustal fragment upwards to thicken the crust and form the Apennine mountain chain. The procedure was complex and involved rotation and warping of each portion as the plates converged (Montanari 2002: 15-18). It commenced in some regions much earlier than in present-day Monte San Vicino which was then a part of the Adria plate. For example, about 80ma the compressive forces began raising the region of Tuscany out of the water. The formation of our section of the Apennines began only about 2-3 ma.

Early Formation of the Chert Sequences

During the period of time (about 200 ma to 20 ma) when Adria was underwater, sediment was deposited and lithified, creating the rocks visible now in the Apennines. The stratigraphic section pertaining to the area of Monte San Vicino is called the Umbria Marche Succession (Figure 1; Montanari 2002: 17-18). This particular succession is composed mostly of limestones and dolomites—both carbonate rocks. At the time of uplift (~20ma), the section is composed almost completely of pelagic sediments –

meaning that they were formed in the open ocean. Marine sediments are either pelagic or neritic, the latter meaning formed on the coastline. Pelagic sediment is fine-grained because it collects in the deeper parts of the ocean. The time it took the fine-grained sediment to move to these depths averages about 0.5 to 1.0 cm/1000 years; it is significantly greater than the time represented by neritic deposits (Sverdrup 2006: 85-86). These fine grain rocks are the same that hold cherty inclusions and therefore, the same resource material for our populations.

The sources for deep pelagic sediments include some non-biogenic but mostly biogenuous sediments. Non-biogenic sources are typically pre-existing rock fragments that have been weathered down and transported by means of wind, water, ice, and gravity. In the open ocean, the only lithogenuous deposits to reach open water are generally very fine grained. The majority of source of composition for the pelagic limestones and dolomites of the Umbria Marche Succession is biogenuous deposits, from living or once-living organisms. They include shell pieces, coral fragments, and skeletons of organisms. In the Umbria Marche sequence, the major sources are cocoliths and foraminifera--both are microorganisms living in the open ocean. When the sediments deposited on the ocean basin are composed of over 30% biogenic material, the resulting deposits are called a calcareous ooze ($CaCo_3$) (Sverdrup 2006: 86-87).

The primary source of the lithic technology for prehistoric people in the Monte San Vicino region is chert, a material found often in limestones and composed almost completely of silica. A widespread precipitate in oceans, silica's mineralogy and composition is dependent on the biogenic organisms. The strength in silica bonds in chert is so great that chert usually resists weathering. Interlocking grains make this material hard and well-resistant. There are three types of crystalline structure in chert: granular microcrystalline quartz, fibrous silica, and megaquartz. The microcrystalline structure is the most common and is the type represented in the area (Knauth 1995: 233-234).

Since the Umbria-Marche sequence of rocks was deposited in the open ocean, the cherts are also defined as pelagic cherts. There are three main types of pelagic chert: bedded, nodular, and laminated (H.G. Reading 1996: 401). The Umbria-Marche sequence contains all three types. The differences in deposition, and thus chert composition and properties, are vital to the understanding of humans' preferential chert selection in the area. Depending on the nature of the pelagic chert (bedded, nodular, or laminated), deposits are more or less likely to become prehistoric tools.

Chert takes so long to form that although geologists study chert devolvement, it is difficult to determine exactly how it forms. According to the work of Wise and Weaver (1974), the majority of oceanic cherts were deposited along shallow continental shelves and margins, submerged banks, or in the deep sea wherever biogenic deposits are abundant (H.G. Reading 1996: 323). Another hypothesis is that carbonate is dissolved at interfaces where solubility changes, like oxic to anoxic zones. Microcrystalline chert is likely to be precipitated as nodular chert near these interfaces of high permeability (Knauth 1995: 232).

The most accepted theory of chert formation is formation by replacement. In most carbonate rock, chert nodules replace carbonate volume for volume with silica. As the pH level of water decreases, the solubility of carbonate increases while the solubility of siliceous material initially decreases and then stabilizes to remain constant. It is this inverse relationship that leads to silicification of carbonate (Knauth 1995: 245). The amount of carbonate replaced by silica does factor into how much chert there is in a certain formation.

In the Cingoli province, geologists accept chert formation as a result of replacement. Supporting evidence includes that the nodules have a calcareous crust on the cortex or external part of the nodule (Minestero 1998: 24). Archaeologist Robin Skeates that the nodules in the Scaglia Rossa were coated with a granular cortex 2-4mm in thickness (Skeates 1997: 5). Sometimes there are even calcitic inclusions of siliceous micro- and macrofossils (Minestero 1998: 24).

Chert forms after the limestone has begun to form. Calcareous ooze becomes chalk at a depth of about 200m and then converts to limestone about 600m down. However, alterations to the limestone can occur at any point in formation afterwards (H.G. Reading 1996: 400). The siliceous oozes are one source material for the formation of pelagic chert. Even cherts with similar origins differ greatly in composition and properties. The amount and constitution of the detritus material changes the composition of the chert. The conditions of reduction or oxidation vary the material as well; in oxidizing conditions, the chert will be lighter in color and contain different materials than under reducing conditions. Reduction forms darker cherts with a higher content of elements such as methane, hydrogen sulfide, and uranium. The salinity of the water also plays a part in the percentage of impurities in the chert (Luedtke 1992: 19-52). These differences create a wide range of cherts varying in structure, color, and composition, ultimately resulting in a range of raw materials available for the production of stone tools.

Types of Available Chert in the Monte San Vicino Area

In the Umbria Marche stratigraphic sequence, the formations containing materials relevant to the lithic industry are those defined as cherty limestones; the source rock is limestone with chert inclusions. The specific formations that crop out in the Monte San Vicino area are (from oldest to youngest) the Diasprigni (Diaspri), Maiolica, Scaglia Bianca, and Scaglia Rossa (Figure 1).

The Diasprigni Limestone formed during the late Jurassic (about 150 ma) and is approximately 60-120m thick. It is a medium-bedded limestone with chert and was formed at the depths greater than other limestones in the area. The ocean floor on the Adria plate was a series of grabens and horsts. Faults produced these two features. The grabens represent the lower portion of the faulted floor. The horsts represent the higher portion. The Diaspri was deposited on the uppermost sections of the grabens. The limestone, deposited so far down, is different shades of green, blue, and red. The chert nodules are all a green shade (Montanari 2002: 20-22). The Diaspri chert is actually rarely found outside of the Musone River's reach—outside of the river basin including Coldigioco (Minestero 1998: 24).

The Maiolica Limestone is in places up to 500 m thick, and was deposited at the beginning of the Cretaceous (about 140 ma). This white limestone is formed from the skeletal remains of cocoliths, planktonic algae. Like the Diasprigni, it is also classified as a medium bedded limestone with nodules of chert. The chert from the Maiolica formation, unlike Diaspri chert, is white and is more prevalently bedded than the Diaspri (Montanari 2002: 23-24).

The Scaglia Bianca formation (Late Cretaceous), translated from Italian as "white stairs," is another white limestone with chert inclusions. This unit, only approximately 60 meters thick, was deposited in a calmer pelagic environment than the previous formations. It is composed mainly of foraminifera shells in a cocolith matrix with a higher clay content than down section. Classified as a medium bedded limestone, Scaglia Bianca limestone contains nodules of chert that are much like the Scaglia Rossa formation (Montanari 2002:23-25).

The final important, chert-inclusive formation is that of the Scaglia Rossa, or "red stairs." This formation is a much larger section than the Scaglia Bianca; it stands about 370m thick at the thickest part and is sub-divided into 4 sections: R1, R2, R3 and R4. The lower most section of the Scaglia Rossa, R1, and the upper most section, R4, are the only two sections with chert inclusions. In our area, the only largely exposed section of the Scaglia Rossa with chert inclusions is section R1. Thus for our purposes, the R1 formation is the most important. The formation is composed of mainly pelagic sediments originating from cocoliths and foraminifera. However, the composition reflects changes in the environment. Oxidizing conditions introduced hematite into the mix and stained the limestone various shades of red and pink (Montanari 2002: 24-26).

In addition to color differences, variation in the qualities and properties of chert sources in the Umbria Marche sequence are fundamental to the way prehistoric people chose their source material for their tools. Any slight variation in the composition, deposition, structure, inclusions etc. of the source material vastly exaggerates differences in the properties of the resulting rocks, and therefore chert quality. Based on visual examination of the various cherts in the area, we can conclude that some cherts would be more suited for tool use. The Diaspri chert forms in smaller nodules, not big enough for human tool-making purposes. In our area, weathered out Diasprigni chert is rarely found in sediment size greater than 10 cm across. Although it is more common than the Diaspri, the Maiolica contains very small sections of chert because it is so thinly bedded. The thin bands in which it appears would make this type of chert also inadequate for tool creation. In the Scaglia Bianca, chert is more thickly bedded and would have medium-size nodules of chert. The beds of chert, however, are not as frequent as in the Scaglia Rossa. The R1 section of the "red stairs" contain large, recurrent nodules of chert. Perfect for extraction and large enough for lithic technology, the Scaglia Rossa chert, geologically, was a good raw material source for prehistoric people.

Current Geologic Processes in the Area

After the formation of the Umbria-Marche succession, and following the uplift and tectonic history of the area, recent geomorphic history began less than 2 ma. At the end of the tectonic activity, the area was left thrusted and folded into the Le Marche Apennines belt with calcareous formations in the center of the folds. As the mountain chain was eroded and worked by geologic processes over millions of years, the current fill became composed of Cenozic terrigenous deposits (Savelli 28). Terrigenous simply designates deposits on land from deposits in water or glaciers.

Stream power dominates surface processes in the area. Streams erode mountains and deposit alluvial fans at their bases. The area of Coldigioco is in the Musone River Basin, and the upper reaches run off of Monte San Vicino, the large, local mountain. The water power of rivers, such as the Musone, cut through not only the recent Cenozoic deposits, but also the older formations of calcareous origins. The upper reaches of the river cut through rocks ranging from Jurassic to Paleogene formations, causing the formations from the Massiccio to the Scaglia Cinerea formations to crop out. This erosional activity also exposed the cherty formations discussed previously (Savelli 1994: 28).

As the rivers cut through the area in the Pleistocene (starting 1.6ma), they left terraces. A terrace is a flat piece of land with steep sides at the edge. It is deposited originally on a floodplain, and as the river downcuts, the piece of land becomes a terrace. In the Monte San Vicino area the terraces are particularly defined. We use the definition of T1, T2, and T3. T1 represents the oldest formed terrace at the highest elevation. T3 is the lowest and consequently the youngest. The lower Pleistocene deposited the initial formation of strath terraces (bare-surface terraces) which was followed by four different Middle to Upper Pleistocene phases of aggradation (deposition) forming each of the alluvial terraces (Savelli 1994: 28).

The terraces are important to note for dating in Le Marche. We recognize different dates for each of the terraces, and relatively dating human activity becomes is easier if we can place associate artifacts on a terrace level because we can compare to know terrace dates and order. The terraces are also where populations camped and searched for lithic resources. The stream power, as demonstrated later, is the main reason that lithics were so available in the area. Since alluvial terraces are made up the carbonate gravel from the relevant cherty sections of rocks, nodules of chert were readily obtainable for groups living in the area.

T1, the oldest terrace, is lower Pleistocene (about 1.5 ma) in age. This terrace is lacking in alluvium. There are two viable explanations for the missing terrace alluvium. First, it is possible that the alluvium just was not preserved—any number of erosioinal events could have carried away the remaining deposition. Second, no significant amount of aggradation might have taken place in the lower Pleistocene and therefore only strath/planation surfaces were formed (Savelli 1994: 31).

The T2, second order terrace, is mid-Pleistocene in age. The alluvial material composing the terrace is made up of Mesozoic to Cenozoic age sediment from nearby ridges. In our area the ridge is Monte San Vicino. The sediment profile is mostly poorly sorted, well-rounded pebbles. The T2 and T3 terraces are still very well preserved and prominent in the area (Savelli 1994: 31).

The third alluvial terrace, T3, is well conserved from the last glacial stage of aggradation. The alluvial content is composed of rounded carbonate gravel, specifically from the Monte San Vicino ridge (Savelli 1994: 31).

The regional geologic divisions fall into three categories: coastal lowlands, inner lowlands, and the inland intermontane gorges, valleys and mountain-sides (Skeates, 1997: 51). The Monte San Vicino area falls into the intermountain gorge area. This area is also described geologically as the Piedmont region. It is in this area where all of these terraces fall. The region is characterized by alluvial fans and smooth, low hills. Small north-eastwards flowing streams divide the rounded hills (Savelli 1994: 32). Piedmont depositional systems consist mainly of braided stream channels—streams that transport more sediment than they can carry resulting in large, sedimentary deposits.

The thickest and widest of these alluvial fans forming at the base of the Apennine Mountains are the Coldigioco and Ca' di Crescio alluvial fans. An alluvial fan is defined as a fan-shaped body of sediment deposited by streams at the base of a mountain. The Coldigioco fan exceeds the Ca' di Crescio fan in size only by a small amount. The Coldigioco fan is where the Observatory for Geology lies and, consequently, is the epicenter of all the sites on which we concentrated. The fan is mid-Pleistocene in age, and the main river tributary is the upper Musone river region. The Musone is supplied with sediment from upper reaches of Fosso di Frontale and Fosso del Crino. The Fosso di Frontale and Fosso del Crino rivers cut through and erode the Mesozoic-Paleogene limestones that form the edge of Monte San Vicino. The sediment load comes almost exclusively from these carbonate sequences, including coarse and angular pebbles. This is a good indication that the sediment has not traveled very far in the river bedload (Savelli 1994: 32-34).

The Coldigioco fan terrace itself rises about 55m above the stream levels of the Musone. The upper-most section of the alluvial terrace is carbonate rich forming a calcareous "crust." The alluvial material is mostly composed of gravel deposits from the depositional activity of the stream flow. The fan remains active in present time (Savelli 1994: 34). The placement of the prehistoric sites on the active alluvial fan is significant because it shows a preference for location next to valuable resources. The Coldigioco fan is directly beneath the Monte San Vicino ridge, the source for most accessible chert. The fact that the fan was large and active throughout the settlement history of the area was vital to the availability of chert nodules; the vastness of the fan means more sediment influx and therefore, more resources from which to choose. The active streams surrounding the fan, create the terraces and are the mode of transportation for chert raw materials that people preferred for many thousands of years, as I will discuss below.

Environmental Conditions

In Italy as in most of Europe, the prehistoric period is characterized by drastic environmental change composed of many switches between glacial and interglacial conditions. Each change forced a new type of living condition on the people in Le Marche and for the populations in Europe as a whole. While the sources and availability of lithics remained relatively consistent throughout the last two million years, the environment was changing. Changes in settlement history were not due to changes in the availability or preferences for raw materials. In fact, I contend that the strength of the raw material source (the Scaglia Rossa itself) was a significant factor that kept populations returning to the Monte San Vicino area despite changing climatic conditions.

Glacial/Interglacial Environmental Conditions

The trend of glaciation/interglaciation can be explained in a general timeline. The earliest of prehistoric groups moved south during a period of glaciation starting about 330ka (thousand of years ago). This period is called the Riss glaciation, and it eventually gave way a warmer period about 145ka. The eventual end of this interglacial period marks the boundary between the Lower Paleolithic and the Middle Paleolithic. The interglacial is also situated between the glacial periods of the Riss and the Wurm glaciation beginning at about 110ka. The Wurm glaciation spanned both the Middle and Upper Paleolithic time periods. As the climate warmed again, the area entered the postglacial period which also lasts through the present day. The postglacial period began directly after the Younger Dryas which correlates with the beginning of the Mesolithic period.

The Mid Pleistocene periods of glaciation and interglaciation, circa 250ka, were more dynamic in temperature highs and lows than later periods. Glacial periods are characterized by low sea levels and a very cold annual climate. In the Marche region the environment was arid with an expansion in the amount of forested areas (Mussi 2001: 59). It reflected steppe-like conditions with a deciduous forest in higher elevations (Gamble 1984: 243). During periods of glaciation, there were significant loess deposits (very fine-grained, wind-blown sediments) as a result of the strong winds and arid, cold climate (Mussi 2001: 59). For the inhabitants in search of warmer, more moderate temperatures, the majority of the "animal biomass" converged in the southern and Mediterranean regional areas during full glacial conditions; the primary game during this time was the red deer and the steppe horse (243).

Interglacial temperatures are annually cooler than non-glacial periods (like present day) but have relatively warmer annual temperatures in comparison to fully glacial periods. Interglacial periods are characterized by these warmer temperatures and a higher sea level as the water melts out of the glaciers. In the central Mediterranean area, the deciduous mixed oak forest and quercus ilex (evergreen) forest were evident during all interglacial periods (Gamble 1984: 243).

Environmental Conditions Specific to the Region

As a result of the limited exploratory research in Le Marche and a lack of intact sites, the environmental reconstruction cannot be very specific for the Mid Pleistocene periods. However, a few generalizations may be made beyond the general characteristics of glacial/interglacial conditions. During the Mid-Paleolithic (circa 110 ka), the archaeological and depositional sequence of the Marche region is distinctly similar to that of the Northern sequences of the Po River Valley. The Po River Valley borders the Marche region on the northern side and serves as a good reference because it is a much better studied area. The difference lies in that lithic is the only resource preserved in Le Marche despite paleoenvironmental research. The Po River Valley, on the other hand, provides us with botanical evidence. These two places are similar in location and geography and for this reason data taken from the Po River Valley can be provisionally applied to Le Marche. Therefore, based on the similarities and the evidence of charcoal in northern Po River deposits, we can conclude that the environment throughout the whole area was temperate and rainy with interspersed forests during the interglacial period (Mussi 2001: 112-113).

The glacial maximum – the point at which the most water was locked in glacial ice and the most extreme glacial conditions were met – was expressed in the severity of the landscape. From about 16,000-25,000ybp (years before present) Le Marche was a "denuded landscape" composed primarily of loaded rivers and braided stream channels. Both loaded rivers and braided streams contain a large carrying capacity for sediment. The streams become clogged with sediment and transport very large amounts for a relatively short distance. All rivers were heavily burdened with detritic/sedimentary deposits as erosion cut through the higher mountainous landscape and deposited large amounts of rock fragments and sediment in the alluvial fans (Mussi 2001: 270). This period in particular was responsible for the large deposits of chert nodules in the channel deposits. This last glacial maximum was actually a period of great stability which led to good, solid sedimentary coastlines (Milliken 1998: 277). When conditions began warming, these open, arid, and scarred landscapes gradually changed to form a wooded environment with a relatively arid climate. This revegetation took place during the Upper Paleolithic after the Wurm glacial max (Mussi 2001: 191).

Continuing warming conditions meant that the sea level was rising. Beginning in the Mesolithic (or "middle stone age," c. 120 ka) and well into the Neolithic (or "new stone age," c. 11 ka), the sea level reached heights so prominent that the coastline of Italy was inland 25 meters from the present day coastline. The inner lowlands were forested by a mainly deciduous wood; the mix included evergreens and oaks. The area contained a dense, thick forest. Continuing slightly higher in elevation and arriving in the intermontane basins, quite a range of environments prevailed. The area was dominated by microclimates varying with location – some forested and some open areas. The Apennines are characterized by a different sylvan mix – mostly that of fir, beach, and spruce trees (Skeates 1999: 17). Despite the vast differences in vegetation, temperature, and animal biomass, we still see a continual human presence in Monte San Vicino. I suggest that this persistent occupation can be explained in large measure by the spectacular lithic resource availability.

Settlement History of the Monte San Vicino and Surrounding Areas

Before 16,000 years ago, during the period of fluctuation between glacial/interglacial conditions, settlement patterns were not uniform in Italy. While many sites were long-term and repeated settlement sites, as many were short-stay sites visited by single people or small groups (Mussi 2001: 246). There is a wide range of time for the earliest inhabitants; dating is not complete enough to determine the exact moment of habitation.

We can infer the earliest people settled in Italy between 330ka and 130ka. These were groups of *Homo erectus*. *Homo erectus* was the first hominid to disperse from Africa and migrate to other parts of the world. Surviving for over an impressive one million years, their cranial capacity, with respect to hominids preceding them, was dramatically increased. The same goes for the overall body size (Turnbaugh 2002: 258-259).

During the settlement time period for *Homo erectus*, there were no major fluctuations in site density. This observation suggests that population sizes were relatively stable and that people moved through regions like Monte San Vicino to exploit resources (including game and lithic raw materials) in much the same way for many years. Italy was among the most regularly used areas of Europe during the Mid-Pleistocene, largely because the proximity of mountainous terrain to coastal lowlands provided a wide range of resources (Mussi 2001: 91). Large, open-air sites along the coast suggest that people regularly visited this region, but they preferred to camp near long lakes at the lower elevations on the shore (41-44, 58).

During the Mid Pleistocene, archaeologists infer a low population density and patterns of seasonal migration throughout Italy. Italy is isolated by the Alps on one side and the sea on all other sides. However, instead of seeing archeological indications of many isolated populations, archaeologists find that changes in lithic industries mirror those in the rest of Europe. This is a good indication of continued contact between Italian groups and other European groups. The contact was limited due to geographical barriers but still present as lithic technology evolved at the same general rate and in the same general ways in both places. From these trends in lithic technology we know that the Italian peninsula is not completely secluded (Mussi 2001: 46-47).

During the Mid-Paleolithic at the stage of building up to the glacial max, colder climates and growing ice caps forced populations to abandon the Northern provinces of modern-day Germany, Poland, Ukraine, and areas north of these countries. These populations moved further south and especially into the south-western and Mediterranean regions (Gamble 1984: 253). As a result of this migration sites throughout Italy are more widespread and numerous than in earlier times (Mussi 2001: 101). The group that was prominent in Italy during the Late-Lower and Middle Paleolithic time periods was *Homo neanderthalensis.* Neanderthals are a population of archaic humans. The physical features of Neanderthals made them better adapted to colder conditions. Neanderthals are somewhere in the evolutionary "bush" that eventually contained Homo sapiens. Anthropologists continue to debate whether Neanderthals are among the ancestors of fully modern humans, *Homo sapiens neanderthalensis*, or whether they represent a distinct species, *Homo neanderthalensis*, that completely went extinct with the advent of warmer conditions and the better-adapted Homo sapiens.

Neanderthals were robust anatomically; their bodies were larger than modern *Homo sapiens* due to the adaptation to cold climates. Their cranial capacities were also larger on average than those of fully modern people (Turnbaugh 2002: 299). Neanderthals appear in Italy after the Interglacial period between the Riss and the Wurm about 130,000 years ago. This is the beginning of the Mid Paleolithic, and the decline of Neanderthal populations corresponds with the beginning of the Upper Paleolithic (about 50,000 years ago), although pockets of Neanderthal populations persist in some parts of Europe until approximately 28,000 ybp. The Neanderthal populations, in geologic time, are placed in the Late Pleistocene. Their lithic techniques are described later.

Their colonization of Italy was highly successful. They explored a majority of the territory and occupied many different niches (open-air sites, cave sites, etc.). Their presence was most likely spatially continuous in the area; however conclusive evidence is lacking (Mussi 2001: 149). The sites unfortunately are not well-preserved. The Wurm period of glaciation during the subsequent Upper Paleolithic caused the sea level to drop as water became locked into glacial ice. As a result, the erosive capability of streams increased as large volumes of water were once again pushed through area streams, and degradation was prevalent. Most open- air sites had been located on river terraces, and most were consequently destroyed (101, 105).

The period of glaciation in the Upper Paleolithic that destroyed most Neanderthal Mid-Paleolithic site features also had serious consequences for the *Homo sapiens* populations in Italy. *Homo sapiens sapiens* are considered fully modern humans. They are directly related to us and are considered "direct kin." Fully modern humans are less robust than Neanderthals and have a proportionately smaller brain. The skulls of *Homo* *sapiens* lack the distinguishing brow ridge features of Neanderthals. The fossil evidence for *Homo sapiens* places their arrival in Italy over 40,000 ybp (Turnbaugh 2002: 317-319). At first, the technologies of *Homo sapiens* and Neanderthals seem similar but eventually, in the Upper Paleolithic, archaeologists note appreciable technological changes. The lithics of these groups are discussed later.

Margaret Mussi, an archaeologist and historian of prehistoric Italy, argues that during the Upper Paleolithic, when fully modern *Homo sapi*ens were the dominant population, there were fewer sites overall than in Neanderthal times. At the peak of the glacial max (20-19,000ybp), the mid latitudes were generally unoccupied as people continued to move further south (Mussi 2001: 273). She also suggests that after the glacial max, settlement increased as higher altitudes that had been deserted were reoccupied. Recolonization, according to Mussi, began earlier in the Marche area, at about 12- 11,000ybp (203, 317).

There is, however, evidence of surface artifacts from the sea level on the coast, up to the high Apennine regions in both Marche and Abruzzo during the late glacial. The sites we find during this time period, or in these regions, are those in the mid-latitudes. Monte San Vicino falls in this geographical area. This area, situated in between coast and mountains, takes advantage of a wide geographical range of the local resources. Homo sapiens had access to the ibex who reside in the higher, mountainous regions, and the red deer who winter in the lowlands. The most prominent sites in the mid-latitudes, above the lowlands, and at the foot of the mountains *are the* Ponte di Pietra, Grotta della Ferrovia, and the Grotta del Prete (Barker 1981: 138). With the recession of glacial conditions after about 17,000 years ago during the Upper Paleolithic, every regional area, including Central Mediterranean, had enough resources, or "energy," available to maintain at least several human groups (Gamble 1984: 249-250).

Postglacial conditions began to stabilize as the ice melted and the sea level rose. The shoreline was stable for only short periods of time and was relatively poorly developed as a result of the rising ocean; as glacial ice melted, the shoreline continued to move inland and therefore was continuously a newly formed, immature shoreline. Therefore the hunter-gather tribes were not well supported on the coastline during the end of the Upper Paleolithic and early Mesolithic (Milliken 1998: 277-278). There was more continuity in Apennine mountain settlement than in the Alps or shoreline during the late glacial. The central section of the Apennines (including the Abruzzo/Marche region) was more habitable in contrast to the rest of the Apennines because it is further south (and therefore warmer) and has wide basins (Mussi 2001: 317).

The transition out of periods of glaciation and into the modern postglacial environments allows us to infer the climate and environment during the Mesolithic-Neolithic. The present-day climate in the central Apennines (the mountain portion) during the winter months (November-April) is very cold and the snow stays on the mountains for months. The mountains at some points are uninhabitable; the intermontane basins receive a large amount of snow also during these months. The exact opposite is true in the summer; fauna is very likely to arrive in these regions as they are cool and provide good water sources (Barker 1981: 39). A likely strategy for the fully modern people who occupied this region was to utilize the intermontane areas as seasonal sites during the summer months.

In fact, there is evidence for seasonal occupation in the upper elevations with a few single-purpose specialized sites. About 9,800-9,500ybp, base camps were located at the bottom of valleys and are characterized as open-air sites (Mussi 2001: 138, 313-314). Open air sites, in contrast to cave sites, were out on the ground with limited *or* no shelter. Many of the camps were around low-altitude lakes. Settling near lacustrian environments was a part of a multi-faceted subsistence strategy; lakes provided a source of water not only for them but also a primary source for their prey (314). Forty-nine percent of known sites in the Mesolithic/Neolithic lie in the coastal lowlands, 11% in the inner lowlands, and 40% inland. The pattern is similar all over the Mediterranean and Europe (Skeates 1997: 52).

Most likely, the settlements, in not only the Monte San Vicino area but also Le Marche and surrounding areas, were seasonal during the Mesolithic and Neolithic much as they had been during the Middle and Upper Paleolithic. The evidence from surrounding areas points to a trend for seasonal occupation for higher elevations in particular. It is very likely that sites were reoccupied from Mesolithic to Early or Late Neolithic times (Skeates 1997: 52). However, by the Neolithic it appears that some of these sites, rather than being seasonally occupied, had become relatively permanent base settlements. The Neolithic site of Torre Beregna, near Monte San Vicino, has prehistoric coarse ware dating to Early Neolithic. Pottery is a significant indication of residential areas (Skeates 1999: 9).

We do see more sedentary habitation of the larger Cingoli area (including our smaller sub-area of Monte San Vicino*)* during the Neolithic – in particular the tracts of land running alongside the Musone River on fluvial terraces. It also appears that, in addition to increasing sedentism, population density was increasing during the Neolithic. One particularly densely settled area was the Moscosi area, or the Monte San Vicino area in our terms. This inference is based in part on artifacts found during a surface survey conducted by the Cingoli Museum of Archaeology of the Piano di Fonte Marcosa area (Minestero 1998: 33).

In sum, throughout the prehistoric period from 250 to 9 ka, we note a general trend of nearly continuous human activity in the Monte San Vicino region. Most sites were probably seasonally occupied before the Neolithic, when more dense and sedentary sites appear; throughout all time periods diverse food and lithic resources drew people to the area.

Lithic Technology or Prehistoric Groups in the Monte San Vicino Area

After discussing settlement patterns of human groups, it is important to note what human groups settled the Monte San Vicino area during what times and how they advanced lithic technology. Each group had their own lithic material and improvements on the previous population's technique.

Lithics of Homo erectus

The lower Paleolithic tends to correspond with the population of *Homo erectus*, the hominid preceding the more modern Neanderthals. The occupation of *Homo erectus* in many parts of Europe ranges from 650,000ypb to about 120,000ypb (Mussi 2001: 45). In geologic time, the span begins in the Mid Pleistocene and ends in the Mid-Late Pleistocene. *Homo erectus* has the smallest brain in comparison to both Neanderthal and

Homo sapiens. Their body frame was similar to that of *Homo sapiens,* although they were less robust than Neanderthal. The tools of early *Homo erectus* in Europe are of the Acheulian lithic culture. These tools are defined as mostly "hand axes and cleavers [and] large shaped cutting tools" (Fagan et al. 1996: 552). The Acheulian technology was composed largely of a tool called the biface; this tool was worked on both sides of the core. This lead to sharper, more defined edges. The strokes and formation of the Acheulian technology are, however, less refined than the tool technologies of later periods (Turnbaugh 2002: 276).

In addition to characterizing the Homo erectus tools as Acheulian, they can also be described using the system of modes. This broad typology was created by archaeologist Desmond Clark in 1968; he defines the modes as: "Mode I (simple flakes and cores); Mode II (flakes produced by direct percussion); Mode III (wide use of prepared cores); Mode IV (in which blades and burins are dominant); and Mode V (microliths)" (Answers). The previously described industry of *Homo erectus* would be considered Mode II (see Figure 2); the flakes are produced by direct percussion; however, they are not as complex as to be defined as prepared core technology.

There was a large presence of choppers dating to the Lower Paleolithic in the province of Cingoli in two sites called Piane Mastro Luca and La Mucchia. At this point in time, there is no documentation of this type of phase in the region of Le Marche outside of the Cingoli province. The Acheulian tools are present on the T1 level of terrace, the earliest surviving terrace. These artifacts represent the final phase of the Acheulian, ending at the border between the last, Riss glacial period (~150,000ybp) and beginning at the start of the interglacial period (~135,000ybp) (Minestero 1998: 25).

Lithics of Neandrathal

The Mid-Paleolithic time period (c. 120 ka) in Europe is usually associated with Neanderthals. Neanderthal sites contain all Mousterian technology, with a strong representation of Levallois technology (Minestero 1998: 28). The Mousterian is "prepared core technology" leading to "predetermined form and definite tool shapes." The emphasis lies more on crafted tools and increase in scraper usage (Fagan et al. 1996: 212, 553). The cores are prepared and there are sequences in which to hit the cores to produce the type of desired tool. In general, there is a much better understanding of how the chert will fracture and a drive to utilize the lithic planes for more efficient tools (Appignanesi 2006). There is a prevalence of flakes, chips, and blades in this technology (Minestero 1998: 28). We would consider these artifacts from Mode III (see Figure 3). These artifacts are obviously prepared core technology.

Technology and culturally, Neanderthals were of a Mousterian culture for the whole Marche territory. The Levallois assemblage shows little evidence of retouched flakes and tools. Retouching is considered to be the removal of smaller flakes off a core piece for refinement and sharpening purposes. The area in the province of Cingoli is different from the rest of the Marchigian region. There, archaeological sites yield retouched Levallois tools. Neanderthals also began to attach projectile points to natural handles of wood much like a spear. These techniques were unique in the Marche region and could indicate the presence of a different culture, chronologically and culturally. The technology is more sophisticated and does not appear in the rest of the region until after the wurmian glaciation. Most artifacts from the Mid Paleolithic are surface finds on alluvial terraces. Even so, excavations in stratigraphic layers in tact are not clear and are rare in the Marche region. This added to the fact that there are so few artifacts for analysis means that there is no consensus within the academic community on types and percentages of Mid Paleolithic artifacts (Minestero 1998: 28).

Lithics of Homo sapiens

Homo sapiens appear during the Upper Paleolithic during the Wurm glaciation about 40,000ybp. They remain the dominant population in the area after this period. They span the last few thousand years of the Late Pleistocene and continue into the Holocene into the present. These populations are characterized by long blade technology--typical of the Italian Upper Paleolithic. Blades are flakes that are twice as long as they are wide. In the intermontane/ mountain regions, the technology is specific to fully modern human groups (Minestero 1998: 31). The blade technology consists of Homo sapiens' shaving off flat sharp, blades, which Italian archaeologists call lama, from the core nodule. The long, thin blades are chipped off the core by use of indirect percussion; it is called the punch technique. Indirect percussion requires the use of two tools simultaneously. The first is a wedge placed on the edge of the core nodule. The second is a type of hammer tool which hits the wedge. The wedge's focused point of pressure allows the flake to separate without difficulty (see Figure 4). This method of production results in more precise flakes and uses less energy (Crabtree 2001: 152). The evidence is suggestive that these blades were then tied onto wooden shafts or other natural resources to make a handled tool (Fagan et al. 1996: 553). This would be considered Mode IV technology.

Later, following the Mousterian technology, two emerging groups of technology gained popularity--Uluzzian and Aurignacian (Mussi 2001: 167). These are both actual cultural periods but are defined by their lithic technology. As Homo sapiens moved into Italy, the Uluzzian became less popular and the Aurignacian gained popularity. The Aurignacian had a broader distribution specifically in mountain ranges. The switch in tool preference is related to the recolonization of regions during receding glacial conditions (Mussi 2001: 207). Recolonizing Aurignacian groups sought out better lithic raw materials and were "more innovative...more international in their lithics than the inhabitants of the South." Compared to Uluzzian groups, Aurignacian groups were probably a more mobile population and were linked to groups in farther regions. On the contrary, there is no evidence that Uluzzian groups looked for new raw materials, innovated in tool forms, or traveled as widely. Another advantage of the Aurignacian groups were more numerous, and they moved into new territories more easily (Mussi 2001: 207-208). Most information on these two technologies were based on evidence of settlement patterns west of the Apennines. On the eastern side of the central Apennines, however, there are very limited artifacts available for analysis. There are some very prevalent Aurignacian sites in Abruzzo, the neighboring region to Le Marche (Barker 19891: 46). Due to the proximity of other Aurignacian lithic tools in neighboring regions, the high mobility of the groups who used this technology, and their preferential use of intermontane valleys, we can assume that people using Aurignacian technology arrived in the Monte San Vicino area. The final sub-group of Mousterian technology during the Upper Paleolithic is called Gravettian. From 28,000-20,000ybp this technology was mostly "backed blades and points." To date archaeological research has identified no Gravettian artifacts in situ, but surface finds on alluvial terraces in Marche and Abruzzo are relatively common (47).

It is very hard to determine the artifact culture and chronology of the period after the Upper Paleolithic, the Neolithic. The defining characteristics of the Neolithic period are: increasing settlement density, evidence of increasing sedentism, development of pottery and some domestication of plants and/or animals. However, the Le Marche region has received less archaeological attention than other parts of Italy. Thus archaeologists are aware of the locations of very few Neolithic sites and have found few artifacts in stratigraphic context. Archaeologists have encountered an appreciable number of lithic artifacts from this period but have yet to identify quantities of pottery, shelters, fire pits or hearths, possible burials, faunal remains, artistic artifacts, and more delicate tools of ivory and bone common in the Neolithic and to some extent earlier (Minestero 1998: 33; Fagan et al. 1996: 213).

The survival of archaeological materials from all of prehistory in the Le Marche region, especially the province of Macerata, has probably been negatively impacted by farming. For thousands of years, agriculturalists have been cultivating the fields, disturbing archaeological features and artifacts. Judging by at least one channel cut, I estimate that some two and half meters depth of soil has been machine tilled. The move modern technology, for certain, disturbed all levels of human habitation from before the Lower Paleolithic to past the Bronze Age. All the artifact samples that I collected were damaged—either chipped or sometimes almost unrecognizable as tools. Another part of the sampling error stems from the fact that there are many more worked pieces made unrecognizable by the tilling and so we cannot be sure of the numbers of worked tools in any given field.

Procurement Strategies

There are three main types of lithic resource procurement, or acquiring raw materials from which to fashion tools. In order from most to least labor-intensive they are quarrying, extraction, and expedient procurement. Quarrying involves the "excavation of pits or tunnels in bedrock" (Church 1994: 28). It is indeed the most labor-intensive strategy requiring brute strength and organization of tools, people, and knowledge of structure of the quarry. This method is mostly used for preferred resources that require and merit the expended energy. Extraction requires the retrieval of raw material from exposed sources such as ledges, bluffs, cliff faces, etc. The method of expedient procurement is usually reserved for materials that are used for immediate but temporary tactics utilizing neither strategy nor organization for collection; the materials are readily available and are simply gathered. The method consists of removal of the resource from secondary deposits, like creek gravel on depositional banks. This strategy is considered low quality because in most geographic areas the recovered lithic resources are usually smaller sized and of poor quality due to stream transport complications (28-29).

The situation is different in Monte San Vicino region. Here, no evidence of quarrying exists in any of the time periods under consideration. Extraction and the expedient method would be logistically sound, energy-efficient means of acquiring lithic raw materials. The nature of alluvial fans is that the entire formation is material from eroding mountains that has been carried to lower elevations. The Monte San Vicino ridge is composed of the limestone previously discussed. The weathering of these ridges would have actually released the chert nodules into creek beds. Otherwise, the chert would have been firmly embedded in the limestone ledges at a much higher elevation and would have required much more energy and organization to access. Prehistoric groups certainly utilized the expedient method as their main way of procuring nodules. The extraction method was not frequently used, if it was used at all.

The methods of procurement here apply to all four main types of chert in the Monte San Vicino area. Each limestone formation with chert inclusions behaves in a similar manner; chert weathers out of the limestone as a more resistant rock type. The difference in the bedding of the chert in each formation is what determines the size and strength of a nodule. The Scaglia Rossa, in this case, is the best source for tools because the chert inclusions that weather out of the limestone are more likely to be large, resistant nodules. This is in direct contrast to the Diaspri, for example, which weathers from smaller nodules to even smaller fractured pieces.

In order to understand how the chert nodules were being transported, during my summer research we visited the upper reaches of the Fosso di Frontale and Fosso del Crino, the two tributaries carrying sediment near the Coldigioco fan. The upper reaches, resting slightly higher than the base of Monte San Vicino, were plausible sources for chert nodules. We found many chert nodules in the stream channel and along the banks. By far the most prominent source of chert still in complete nodules was the R1 Scaglia Rossa. Other nodules, from various formations such as the Diaspri and Scaglia Bianca, had become brittle and broken in the transport. The same was true for the stream channels at lower elevations. Lower-level streams and banks contained fewer chert nodules than the upper levels, but nevertheless a significant number of chert nodules still appeared the lower banks. Thus people could have easily collected R1 Scaglia Rossa chert nodules in stream beds and banks at higher and lower elevations in the Monte San Vicino area.

When nodules are readily available and retain their strength through transport as the R1 Scaglia Rossa chert nodules do, the expedient strategy seems to be the most energy and time efficient method of lithic raw material acquisition. Collecting chert nodules from stream beds and bands is less labor-intensive but produces the same results as quarrying. Given the lack of archaeological research conducted in the Monte San Vicino region, no direct evidence exists for the methods that prehistoric peoples used to acquire the chert they used for tool manufacture. However, our field survey suggests that the expedient method would have been most efficient and practical. Nodules found in streams or stream beds had already been removed from the source limestone and were extremely easy to pick out of streams. Rather than investing time and effort in quarrying or extraction, prehistoric groups would have just had to pick up the nodules and transport them to wherever they were going to work them.

There is a possibility that, at some points in time, people also used extraction as a method of acquiring chert. At exposed sources, like ridges, the weathering would be more extreme and nodules would take a lesser amount of expended energy then quarrying. However, reaching these outcrops would be more difficult than simply picking nodules up from the rivers at various elevations. The source of in situ chert is high up the Monte San Vicino ridge. Although extraction is a possible resource procurement method, using this method would require greater energy expenditures in terms of travel to the source sites and effort to dislodge chert nodules from the parent limestone. Future field work, checking for evidence of extraction along open rock faces, might reveal whether or not prehistoric peoples used this technique in the Monte San Vicino area. My hypothesis is that field inspection would reveal little evidence of extraction, because expedient collection of R1 Scaglia Rossa chert nodules from stream beds and banks was an efficient, effective means of acquiring an excellent raw material for tool manufacture.

Site Descriptions

Now that frameworks for understanding the geology, settlement history, and lithic resource traditions of the Monte San Vicino area are established, it is possible to turn to the particular sites we visited in my summer research. The sites we visited in 2005 were a combination of known habitation areas and ones that we discovered. Our source information for the known sites came courtesy of Paolo Appignanesi at the *Museo Archeologico Statale di Cingoli*. The site map was of the region of San Severino, Marche, and my region of focus was the area directly on the Coldigioco fan under the heights of Monte San Vicino. Figure 5 is the state department's main map of prehistoric sites for the region; it shows the edge of our area in the middle, left area of the map. The area is referred to by numbers 42, 43, and 44. Figure 6 is the key to the map which gives site names and details the lithic evidence. In a zoomed-in map of our area, all sites – those known before our field work and those we discovered in the course of our research – are indicated in Figure 7.

The identification of a settlement area on the map is indicated by a highlighted pink section. Each site is labeled as Paleolithic (Lower, Middle, or Upper), Mesolithic, Neolithic, Copper, or Bronze (Figure 6). The creators of this map identified sites by latest industry for which there is evidence at that location. People from earlier periods could have used these sites; however, the archaeological map we received only labels the sites by the latest technology. Even if that technology is only a small percentage of the prehistoric material, the site is still named for the *latest* technology. These sites, identified and dated on the map, were simply a starting point for our research. We investigated all known sites in our area and in the process identified several new sites. The new sites were not previously recognized, and therefore we initially had no knowledge of their occupation dates or what people had created the sites. Unfortunately the Cingoli Archaeological Museum, collection point for prehistoric site information of Le Marche, cannot identify very exact dates for settlement ages. Because the culture history of this region is not well established, our fieldwork represented a preliminary stage in the research process, to identify new sites and make educated inferences about periods of occupation and the identities of site occupants. Future research, through additional testing at sites we visited, could confirm or refine our inferences.

We sought to make general statements such as what period of time an artifact comes from based on the technology it exhibits. There is little to no information that can pin a numerical date on the beginning or end of the Paleolithic. The same goes for the Mesolithic, Neolithic, and later periods. The geological processes in the area make finding *in situ*, datable artifacts very difficult as rivers erode through the landscape and deposit artifacts on Terraces 1, 2, and 3, if not farther downstream (Appignanesi 2006).

Also, as the river deposits sediments, they cover older land. There may be a discrepancy here as older sites may be covered by more recent fluvial deposits. According to Robin Skeates, if we rely on surface survey as has been done to date, we cannot be sure of the amount of sites in the area with so much alluvial processes (Skeates 1997: 50).

The massive farming industry in Le Marche also complicates the identification of archaeological sites. Most plots of land are used for crops and so are cultivated (Appignanesi 2006). In fact, at least 90% of the artifacts we recovered in the 2005 field season had endured some damage due to farming technology. Plows expose and destroy site layers. They also mix sediments down to about 1.5 meters leaving no in tact layers. The steel blades of modern day farming technology damage lithic artifacts and any more delicate artifacts, such as faunal remains. Lithics are still somewhat possible to find; chert is resilient. However, it is difficult to find in tact sites or surviving artifacts that are not made of silica.

Another reason for the incomplete data is due to lack of archaeological interest in the area. The more popular regions of Italy include the Po River Valley, just to the north of Le Marche, and the southern areas of Calabria and Puglia. These areas are known to have been heavily populated, and there is a strong tradition of research in these areas. The lack of research in the Le Marche region has had a circular effect; little research leads to less interest and *vice versa*.

Our research in the summer of 2005 was designed to help remedy this lack of information about use of this region in prehistory. Upon discovering a site area of interest, we approached the area from a geological perspective to note any particular features that would have been an asset. For example, site PDR (discussed later) was located on the edge of a lake. After considering the geology, we then began our artifact survey. We conducted a walking survey with about two feet in between lines. There were usually two of us but sometimes I was alone in these investigations. We randomly selected where to start walking, considering the field to have randomly placed surface artifacts. Picking up any pieces of chert that were possibly worked, we examined the lithics as we went. All artifacts that showed signs of human activity were taken to Paolo Appignanesi for verification. Some sites had certain features that required a more extensive research design; I discuss these aspects as appropriate in each of the site descriptions below.

Our goals in site investigation were to 1) find all surviving surface artifacts to generate hypotheses about who was there when, 2) establish relative dates for all sites in our area, 3) identify each artifact by a culture and a population, and 4) acquire any additional information about the geology of the area.

Because of the preliminary nature of this research, we used methods that might have introduced bias to our conclusions. We only concentrated on surface finds, for example, and most of these were located in fields that had just been plowed in the early summer. With the exception of the PDR site, there were no locations that showed promise for excavation. Also, we likely had a sampling error. We had learned what lithic fragments should look like and, we only picked up fragments that fit this description. If there were other artifacts in our area, we might have missed them because our focus was on the lithic materials. We might have overlooked artifacts made from bone, for instance, because we were better prepared for identifying stone tools.

Site Aqualiberta (ACQ) - Self discovered

The exposure to this site is due to a road cut exposing the fluvial deposits of T2. After a thorough search of the exposure, however, all that remained that was visible along the surface of the cut was one artifact. The flake is clearly taken from a nodule of R1 Scaglia Rossa. The outside of the flake is crusted with limestone. The most distinguishing feature of this flake is the bulbous point of percussion on the ventral surface of the flake. The way in which the bulb of percussion was formed and the size of the flake points to Neanderthal populations and is therefore from the Mousterian culture. It is not further worked and was most likely simply debitage.

Despite our hope that this site would turn out more artifacts, it only produced the one in our surface survey. Unfortunately even with a clear artifact definition here, its position in a channel deposit gives us no more clues about where it came from or what else was going on there. The artifact in Aqualiberta was from the R1 Scaglia Rossa.

Site Castellette (CAS)-map defined

Castellette is an area defined by the Museo Archaeologico's master map as number 44. The key indicates that this site was a resource area during the Middle Paleolithic. Unfortunately our field check did not reveal any artifacts in this area. However, it is located only about 250 meters from our next nearest site (PAL) which does contain artifacts. It is possible that this location was simply an area used for collection and not production due to the lack of artifactual evidence. However, it must also be considered how the geology and/or farming could have altered the site. Based on our field work and the identification of the site as Mid-Paleolithic from the Cingoli archaeological map, we can infer that the site was labeled based on very few recovered artifacts. The site was occupied during the same time period as sites ACQ, CDG, FFR, and PAL.

Site Coldigioco (CDG) - self defined

The site of Coldigioco is located directly behind the Observatorio di Geologico in a field. We found artifacts from a wide array time periods and styles in this site area. One lithic artifact we identified resembles the work of Homo erectus in the Lower Paleolithic. The small flake shows no bulb of percussion and appears to have been a removed from a nodule resembling the erectus method of "whittling," rather than with Neanderthal methods of producing prepared cores and flakes of pre-determined shape and size, or of later populations' production of thin blades. Another artifact we found appears to represent Levallois technology; it is a small scraper (<4 cm wide). If further research confirms that this is a Levallois artifact, this designation would place this particular artifact in Mid-Upper Paleolithic time period by either Neanderthals or Homo sapiens. Also recovered at the site were a number of blades formed during the Upper Paleolithic by Homo sapiens. These blades range in width from 2-3cm. One additional artifact I cannot place into a particular time period. Crusted with limestone from the outside nodule and with no evidence of reworking, it is clearly only a piece of debitage.

The dating of this site is somewhat difficult. It seems to span most other sites as there is evidence from Lower-Upper Paleolithic. The range in time periods and technologies at the site of Coldigioco indicate a strong, continuous presence in the area. All gathered artifacts in Coldigioco were from the R1 Scaglia Rossa.

<u>Site of Fosso di Frontale (FFR)-map defined</u>

The site of Fosso di Frontale rests on the edge of the Frontale River and is only about 75 meters away from the convergence point of the Frontale and the Crino rivers. The map defines this area as containing lithics from both the Mid and Upper Paleolithic. The majority of the artifacts that we collected in 2005 appear to be Mid Paleolithic. All nine recovered flakes are characteristic of the Neanderthals' method of working lithics. The bulb of percussion is clearly shown in the two larger, chopper-like pieces. The rest of the artifacts are relatively thick flake-tools, retouched along the sides. This is also an indication of the Mid Paleolithic technology and is associated with Neanderthal. The final piece of the artifact collection is a Mode III blade from the Upper Paleolithic, associated with *Homo sapiens*. It is a smaller, longer blade that seems to be from the Upper Paleolithic. It is distinctly a *Homo sapiens* blade formed from shaving a blade from the nuclear core.

The bigger question mark on this site was the recovery of smaller sherds of dark grey terracotta pottery *(*about 6cm in width). These were surface finds in the same area as where we recovered some Upper Paleolithic artifacts. There were about 10 sherds within one square meter of each other. Because they are surface finds, it is possible that these pottery sherds were not *in situ* and date to a recent era. They are eroding out of a site in place, however, according to Paolo Appignanesi, that would place the site in the Neolithic when sedentism, domestication, and pottery manufacture began. Further analysis of the site and the pottery sherds themselves might elucidate this issue. Either way, however, a wide range of time periods of settlement are indicated by the presence of different lithic artifacts created by from different people. This trend, and the fact that all gathered lithic artifacts in Fosso di Frontale were from the R1 Scaglia Rossa, again shows the use of an area and this raw material over many years.

<u>Site of Palazzo (PAL) - map defined</u>

The site of Palazzo is located on the same ridge behind Coldigioco as Castellette. They are so near to each other, in fact, they are numbered 44A and 44 respectively on the Museo Archeologico's map. The description states that Palazzo is a resource site for Mid Paleolithic lithics. The lithics we did find fit the description completely. Perfectly trademark Neanderthal technology is evident in the lithics. Bulbs of percussion common to Neanderthals, are clear on some of the lithics. On others, the distinguishing feature is the manner in which the lithic is worked; a circular core is formed and then flakes are taken from around the outside. The resulting piece looks like Figure 3. The thicker flakes of this type of technology, like we find in Fosso di Frontale, are also found at PAL. These were all formed from R1 of the Scaglia Rossa.

The surprising piece of our assemblage from Castellette is a piece of debitage. This artifact was formed from the Maiolica chert formation. Some lithic artifacts composed of Maiolica chert are indeed found in the Museo Archaeologico of Cingoli, but they are much rarer than artifacts from R1 of the Scaglia Rossa. The fact that some people used Maiolica to create tools suggests that it was a strong enough chert to have been useful. I would suggest an investigation of the rarity of its usage for future research; for the moment, it is not clear why the Maiolica was not heavily used. It could be due to the fact the Maiolica is not found in nodules that are as big as that of the Scaglia Bianca or Scaglia Rossa. Our summer work revealed only one flake that was made from the Maiolica. The manufacturers could have actually used the rest of the core to produce more artifacts. They also might have been unable to distinguish the Maiolica chert from Scaglia Rossa if the calcareous crust on the outside of the nodule was thick. Upon discovering the true nature of the nodule, they might have thrown it away. We can only speculate as to the reasons for evidence of working Maiolica. However, since we do not note its presence in any other site in the area, we can say that if the Maiolica was indeed used to some extent for tool use, it was only a supplementary resource for lithics.

In our summer research, we hoped to refine occupation periods or dates for the Palazzo site. The site gently slopes down, and at the bottom of the field, there is rather deep gully (about 2.5 meters in places). After an investigation of the sedimentary layers, we thought it might be possible to date the bottom of the layers. By dating these last layers, we were hoping we could have some in tact sediment that was just too deep for the plows to have churned up. However, after a thorough visual search of the surface layers, I recovered no new artifacts. Even upon exposing a new face of the sediments from top section to bottom section, there were no new finds. We also failed to find any manner of dating the last layers; they were void of mollusc fossils or anything that could key us into a dating of the layer. It is possible that even the bottom layers were churned by farming activity or if not, that our sample just did not contain datable material. In any case, we were not successful in refining the dates of this site. Future larger-scale archaeological testing might produce artifacts or fossils to tie this site more definitively into regional sequences.

Site Pian di Rote (PDR)-self discovered

The farthest away of our sites from Coldigioco home base, Pian di Rote lies just outside of the town of Frontale. The site, like the site of Aqualiberta, was exposed by a road cut. While doing previous geological work, Alessandro Montanari came across some flakes of Scaglia Rossa. Later, in the summer of 2005, we revisited the site hoping to find additional artifacts. Prior to this work, the site had not been touched by archaeologists. Unlike the others where there was always a possibility that outsiders had taken away some surface artifacts, this site had clearly received no attention archaeologically or simply out of casual curiosity. We cleared the vegetation and began our search for flakes.

We soon found artifacts, uncovering lama blades of the Homo sapiens. The characteristically long, thin blades were unmistakable. The majority of the blades were broken along the horizontal axis. All the lithics were from the R1 of the Scaglia Rossa formation. The recovered artifacts were within three-quarters of a one-square-foot area. The collection area was bordered on one side by a road cut. About 4 inches into the road cut is where the artifacts were uncovered. Judging by the soil layers, we inferred that the area had not been touched. The layers strongly appeared to mirror the lacustrian environment formation layers. The artifacts were found in these layers and therefore, presumably in context. Unfortunately the layers and area were found about .7 meters at depth. Complications with the complexity of a formal excavation of the area limited our study to only the one less than one square foot area. There was no way to formalize the project and go from top down. Our resources only allowed us to go in to the area from the side of the road cut.

Furthermore, the sedimentary layers in our small excavation area were a sandy-silt, highly indicative of a position near the edge of a lacustrian environment. In this case, the combination of environmental conditions and the recovered technology indicate that this site was sometime after the Upper Paleolithic and into the Mesolithic when climate was such that lakes were a dominant feature in the mid-altitude areas. We repeated our search for a more precise dating method. Once again, the molluscs were not present in the mix. Soil was collected but has yet to receive pollen analysis that might refine dates for the area.

Findings of the Sites Surveyed

This research was primarily preliminary; with so little known about the prehistory of the Le Marche region, we wanted to increase the basic knowledge of cultural history in the area. The sites, both known and discovered, produced evidence for a wide variety of populations—ranging from *Homo erectus* through Neanderthals to early *Homo sapiens* and later Neolithic groups. The evidence for tool manufacturing ranged from highly developed to minimal working. However, one constant we noted at each site was the prevalence of the Scaglia Rossa chert as a raw material for creating tools of diverse types in diverse periods. The availability of Scaglia Rossa nodules in stream channels and its excellent properties make this a wise choice for the primary raw material. Although they were other sources for chert (the Diaspri, Scaglia Bianca, and Maiolica), each population chose to make little, if any, use of these other resources. Future research into the question of why groups had such a preference for the Scaglia Rossa is suggested.

Contextualizing Our Research Area

Other researchers working in adjacent areas have identified patterns of site occupation and chert usage that parallels ours and supports my inference that diverse populations for thousands of years used Scaglia Rossa chert as the preferred raw material for stone tools.

Parallel Site

An area of Late Paleolithic sites on the Gargano Promontory in south-east Italy, researched by Sarah Milliken, parallels aspects of the sites in the Coldigioco surrounding area. The sites were situated as they were in the area of Monte San Vicino. The topography in the area was very similar—consisting of coastline on the Adriatic, inner lowlands, and intermontane/valley/mountain region. Not only was the location very similar to the positioning of Coldigioco, but Milliken also found that the primary, if not only, type of chert used in this intermontane region was from the Scaglia Rossa. She reports that similar sources of chert were found; the same formations available for procurement in Monte San Vicino were available for use in the Gargano Promontory. The available sources consisted of upper Cretaceous limestone and marly limestone formations along with Jurassic- Cretaceuos micritic limestones (Milliken 1998: 271). Although she does not specifically name the formations, south-eastern Italy and central-eastern Italy had similar tectonic and sedimentary/chemical activity, and so it can be assumed that the sources available for chert were comparable to the sources of chert in the Monte San Vicino area.

In fact, the chert most likely played a key role in site location. All three of the Paleolithic sites directly on the Gargano Promontory were located in close proximity to the sources of chert. One site, Macchione, is even directly on the Scaglia Rossa limestone facies (Milliken 1998: 272-3).

Milliken also concluded that the river system near that area, dominated by the Tavoliere River, would have been well-watered and could have supported a large group of people and animals in the late glacial maximum. In this case, it is very plausible that groups in search of resources would not have been intimidated to journey into the intermontane regions (282).

This research is important as a direct parallel to our Monte San Vicino sites. Obviously the impeccable source of Scaglia Rossa is recognized as steady and stable in areas outside our own.

Continued Importance of Scaglia Rossa through the Copper and Bronze Ages

Skeates' work in Le Marche and Abruzzo has determined that the chert source continued to be an important resource into the Copper and Bronze ages. During these times (c. 4500ka), in addition to learning to work copper and smelt bronze, human groups also developed larger settlements than had existed during the preceding Neolithic period (Skeates 1997: 51). However, there is still a dominance in usage of the Scaglia Rossa flint, arrowheads, and retouched tools in Copper/Early Bronze ages in this region (60). The region of San Severino, Marche has many documented artifacts on sites that demonstrate this dominance. San Severino borders the Cingoli province and is at the same altitude/section as Monte San Vicino region. The documentation of these sites shows many of these locations still primarily rely on lithic technology into the Copper Age such as the sites of Castellano, Serrone1, Serrone 2, and Colle Montanari. Other sites in San Severino are Colle Argento, Colle Morico, and Gaglianovo show mixed technologies: pottery manufacture and some evidence of copper working along with high numbers of lithic projectile points, blades, and flakes (71).

One of Robin Skeates' sites, in particular, located in the Marche region, shows a continued dominance of the Scaglia Rossa chert as the primary raw material for tools. What makes this site even more impressive is the continued lithic presence reaching into the late ages. The artifact collection of the site of Torre Beregna includes mostly Scaglia Rossa chert tools. These worked artifacts are dated into the Copper and Bronze Ages. The tools were all from the same fine-grained, high quality chert source we find in the Monte San Vicino collection. Skeates found habits in her artifact analysis that were very similar to the practices in Monte San Vicino; she found a variety of nodules that were tested and discarded after they were determined to be of a lower quality than usual nodules (Skeates 2003:5).

The debitage indicates something else about the source of chert. The groups of Homo sapiens in later stages were selective about which nodules of the Scaglia Rossa they would use as indicated by the debris found at Torre Beregna and Monte San Vicino. It is obvious from their treatment of less-than-perfect nodules, their "quality-control," that the source of chert was not challenging to locate or thought of as in danger of being an exhaustible source. Because Scaglia Rossa nodules were so plentiful and accessible in stream beds, people could be both choosy and energy-efficient in their selection of lithic materials. The continued chert technology that was well-developed throughout the

Copper Age in Le Marche is also a good indication that the source of chert was vital to human groups in the area. Their hesitancy to embrace more resilient materials such as copper and bronze work) demonstrates the effectiveness of their own chert sources (perhaps characterized by the modern saying: "if it ain't broke, why fix it?"). The lack of another reliable resource in the area also led to the prolonged success of the chert; there were no metallic resources that were as accessible or abundant as the Scaglia Rossa (Barker 1981: 120).

Conclusions

Fieldwork conducted in the summer of 2005 underlines the value of the Scaglia Rossa for the people of the Monte San Vicino area. In this particular area of central-eastern Italy, throughout all of prehistory we see this as the main source populations used for the production of stone tools. Although other resources, such as game, might also have drawn people to the mountains, this chert was also an indispensable resource that kept people returning to an area in the mountains that might have been more challenging to reach or more difficult in which to find a variety of foods than, for example, on the coastal plain. People may have faced more obstacles moving through the Coldigioco fan, but they continued to do so generation after generation; the utility of the Scaglia Rossa was undoubtedly a large factor – and quite possibly the main factor – in this draw.

In the Monte San Vicino area we note that 250,000 years of inhabitants occupied the area, at least seasonally. Despite the vast differences between the populations of *Homo erectus*, Neanderthals, and *Homo sapiens*, all groups found the source of Scaglia

Rossa convenient and appropriate for their tool-making needs. Also, despite changing environmental conditions, glacial and inter glacial periods, and huntable biomass, there is still a continuous presence in the region.

There was a vast amount of chert resources available in the Monte San Vicino area. The four main types available in the area were all pelagic cherts formed in the same general time period and under similar conditions. Despite the similarities of location and environment under which they formed, the different cherts still acquired different properties. The primary difference in chert quality is based on how the chert was included in the limestone-- some were bedded, some in small nodules, and some were in large nodules. The Scaglia Rossa chert was especially useful to prehistoric groups because it is formed in relatively large nodules.

The geologic location of the Monte San Vicino area was also vital to the primary use of chert. As the limestone weathers, streams transport the more resilient chert nodules down stream, where people can easily collect them. We see evidence that a very wide variety of prehistoric people did so. As my summer research indicated – augmenting the very basic state of knowledge about the culture history of the Monte San Vicino area – *Homo erectus* populations used Scaglia Rossa for their Acheulian tools; Neanderthals used it in their prepared core techniques; *Homo sapiens* during the Upper Paleolithic used it to make diverse types of blade tools, and even later people with increasing technological sophistication that incorporated the production of pottery and metal tools during the Neolithic, Copper, and Bronze ages continued using the Scaglia Rossa chert as a material for stone tools.

Research in areas near the Monte San Vicino region support these inferences. In Margaret Mussi's work, the continuation of *Homo sapien* chert usage into the Copper and Bronze ages while other populations were experimenting with metallics is fundamental. This shows not only a reliance on the chert resource, but also a lack of need to change resources.

Sarah Milliken's work in the Gargano Promontory is also central to my argument. The location, resources, and situation of her sites are a near duplicate of the locations and availability of Scaglia Rossa in Coldigioco. Milliken found stable, progressive sites during the Paleolithic. Based on her research of similar sites, we can conclude that the location and resource availability of Monte San Vicino was very hospitable to groups. The Scaglia Rossa formation is also dominant here in an area outside of Le Marche. The continued existence of different human populations in areas containing Scaglia Rossa chert is promising. It is for these reasons that I conclude that the importance of resource materials was vital to the understanding of continual habitation in the Monte San Vicino area of Italy.