



D O S S I E R S S C O 0 4 P R O J E C T .

## THE SC-004 RESEARCH NETWORK "PREHISTORY AND EVOLUTION OF THE ENVIRONMENT DURING THE LAST 100.000 YEARS IN THE GREAT EUROPEAN PLAIN": AN OVERVIEW

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### 1. AIM AND STRUCTURE OF THE NETWORK

The Research Network "Prehistory and Evolution of the Environment during the last 100.000 years in the Great European Plain" funded by the SSTC (Project Sc-004) has been active for more than 4 years (from November 1992 till March 1997). The objective of this rather ambitious programme was to bring together different branches of science such as loess stratigraphy, palaeopedology, palaeontology, chronology, palaeomagnetism, prehistory and anthropology, within the vast geographical territory of the Great European Plain. These themes of research were developed in an interactive way by 6 teams constituting the structure of the network, the diversity of the approaches being the basis of the originality of the whole research programme. The objectives implied indeed a close cooperation between specialized and multidisciplinary teams able to work together while bringing, each one from its speciality, the elements of the answer to the great problem of man's and his environment's evolution during the last 100,000 years.

For prehistory, the various aspects of the Middle and Upper Palaeolithic were exploited by the team of the Université de Liège (M. Otte), while the Katholiek Universiteit te Leuven (P. Vermeersch) team was more specifically in charge of the Late Upper Palaeolithic and Mesolithic. As for soil sciences, the stratigraphic and chronological framing as well as the palaeoclimatic and palaeoenvironmental

reconstructions were performed by the I.R.S.N.B. "Natural Sciences" team (P. Haesaerts, co-ordinator of the network and F. Damblon) in close and permanent contact with the team of the Universiteit Gent (G. Stoops and R. Langohr) entrusted with palaeopedology and with the team of the Faculté Polytechnique de Mons (J.M. Charlet) for TL stratigraphy. At the same time, the "Anthropology" team of the I.R.S.N.B. (R. Orban and P. Semal) completed the human fossiles catalogue of Central Europe and developed a research programme on fossil ADN and on palaeoimmunology.

In other words, the Sc-004 Network was organised in a pentagonal structure with the I.R.S.N.B. "Natural Sciences" team at its centre for the co-ordination of the whole system, both when collecting data on the field and when analyzing them in the laboratory. In such a structure, one of the main concerns was to allow each team to move on its own pace, taking the specificity of its work and the technical constraints into consideration and permanently keeping an eye on the internal consistency of the whole assemblage. In this scope, it is obvious that the design and the structure of the network were aiming at the optimal utilization of the specific expertise of each team.

### 2. GEOGRAPHICAL BACKGROUND AND METHODOLOGY

The basal structure of the project was entrusted to the I.R.S.N.B. "Natural Sciences" team. It consisted principally in providing the stratigraphic and chronological framework of the loess

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sequences from the Great European Plain for the reconstruction of the climatic and environmental changes that occurred within a time span of more than 100,000 years corresponding to the Upper Pleistocene. This approach was also supposed to provide the needed support for the scientific proceedings of the teams in charge of the archaeological and anthropological aspects of the project. In addition the two other teams were directly involved in complementary studies such as palaeopedology (Un.Gent) and TL stratigraphy (Fac. Polyt. Mons).

A particular aspect of this approach concerned the palaeoclimatic reading of the loess paleosol sequences which was supported by a very diversified set of data. In priority they mainly refer to the nature of the sediments and to the weathering horizons which are recorded as paleosols in the loess series. Special attention was also paid to the periglacial structures preserved in the loess, especially to ice wedge casts, as they are indicative of very cold periods associated with permafrost and mean annual temperatures close to or lower than  $-4^{\circ}\text{C}$ . Other important data relate not only to macrofauna and malacology but also to palaeobotany (anthracology, xylology, palynology, carpology).

From these various data the procedure was to ascribe each sedimentary or pedological event to a specific climatic environment following a gradient ranging from a very cold climate (with active permafrost) to a temperate climate (present day conditions). This system enables a transfer of the lithological, pedological and palaeontological information to a qualitative evaluation of the climatic environment and hence the reconstruction of the relative climatic evolution of each sequence.

Initially, the project mainly focused on the loessic formations of the Great European Plain from the Atlantic up to the Urals; later on, it was extended to Central Asia and Siberia. Such an extension was justified by the possibility of having access to some exceptional loess sequences and testing in such way the stratigraphic and archaeological potential of this vast continent in the natural prolongation of Europe (Figs 1 & 2).

Within this large geographical area about 50 stratigraphic and archaeological sequences were selected; they are distributed according to 7 regional clusters (Figs 3 & 4). From West to East: north-western Europe (Belgium and Northern France), the Middle Rhine Basin (Germany), the Middle Danube Basin (Austria, Czech Republic, Hungary), the East Carpathians Zone (Poland, Romania and Moldavia), Central Russia (Desna and Don Basins), Central Asia (Tadzhikistan) and Central Siberia (Altai, Yenisei Basin and Baikal Area).

For each of the considered regions, the aim was to select the most representative sites combining if possible multilayered Palaeolithic sequences and long stratigraphic records in order to set up a regional sequence which will constitute the basis for the correlations in the vast area taken into account. The basic system consists in comparing the different palaeoclimatic regional sequences according to the principle of sequential stratigraphy in which the palaeoclimatic signals of the various regional sequences are put in parallel.

Such a system implies an accurate timing of the sequences considered. For the period between  $\pm 50,000$  BP and Holocene (upper half of the Upper Pleistocene), the different events were situated in the course of time essentially by way of radiocarbon datings. On the other hand, for the lower half of the Upper Pleistocene (Last Interglacial and Early Glacial), the few TL dates and the data from TL stratigraphy allowed the firm setting in time of the sedimentary and palaeopedological records within the chronostratigraphic system.

### 3. INTERNATIONAL RELATIONS

To successfully launch and manage this great research theme, all teams associated in the Sc-004 project had to be ensured of free access to the field data and to the collections of a great number of stratigraphic and archaeological sequences distributed over a very large geographical area spreaded from north-western Europe to Central Siberia, some of these sequences being considered as national cultural monuments (cf. Willendorf in Austria, Dolni Vestonice in the Czech Republic and Kostienki in Russia).

In this perspective formal and informal co-operation agreements were established with over 30 academies and research institutions belonging to the following countries : U.S.A. (Albuquerque, Dallas, Chicago and Urbana-Champaign), United Kingdom (Cambridge, Oxford and Cheltenham), The Netherlands (Groningen and Utrecht), Germany (Neuwied, Heidelberg and Tübingen), Austria (Wien), Poland (Wrocław, Warsaw and Krakow), Czechia (Prague and Brno), Hungary (Budapest), Romania (Bucharest and Iasi), Moldavian Republic (Kishinev), Ukraine (Kiev and Simferopol), Russia (Saint-Petersburg, Moscow, Novosibirsk, Krasnoyarsk, Irkutsk and Ulan Ude), Tadjikistan (Dushanbe).

Beside these official contacts, the multiple personal links established by the scientists involved in the Sc-004 Network with their colleagues from Western Europe, Central Europe and Russia must also be mentioned here; these excellent relations, transcending political borders and schools of research, have had a decisive influence on the advancement of the research programme, mainly because a free access to all the information available was guaranteed to all.

#### 4. FIELDS OF INTERACTIVE RESEARCHES

##### 4.1. *Lower half of the Upper Pleistocene (I.R.S.N.B., Un. Gent and Fac. Polyt. Mons)*

This part of the sequence brought together the teams of the I.R.S.N.B., the Un. Gent and the Fac. Polyt. Mons, respectively for stratigraphy, palaeopedology and TL stratigraphy. The team of Gent focused mainly on the pedostratigraphic records of the Middle Rhine (Wallertheim and Tönchesberg) and of Central Europe (Dolni Vestonice, Stillfried and Stratzing), combining detailed meso- and micromorphological studies, together with complementary approaches as secondary carbonates. On the other hand, H. Mestdagh (Attaché to the I.R.S.N.B.) worked out sequences of Siberia (Kurtak), Tadjikistan (Tagi Djar), Central Russia (Zeleznogorsk), Germany (Metternich) and Middle Belgium (Rocourt, Remicourt and Kesselt).

In that respect, the TL stratigraphy developed by the team of Mons was essential for fixing the chronostratigraphic background of the palaeoclimatic signal and identifying the Last Interglacial - Early Glacial pedocomplex. Used as a relative dating technique, without any attempt to estimate absolute ages, this method allows to analyze a great number of samples and hence a better control of both the chronological and regional coherence of the TL results, which serve for the correlations of the loess sequences. All in all, 18 sequences were extensively sampled, from Germany (2), Austria (7), Czechia (2), Hungary (2), Central Russia (3), Tadjikistan (1) and Siberia (1), the results being consistent with TL data obtained for China, as well as with those obtained by S. Balescu for NW Europe.

Other aspects of the programme were completed in co-operation with the Centre de Physique du Globe de Dourbes (Institut Royal Météorologique). The aim of this research was, on the one hand, to identify a palaeomagnetic excursion from the end of the Eemian Interglacial (the Black Event) as chronological marker and, on the other hand, to apply the magnetic susceptibility as a signature for the paleosols. For the Black Event, sections were sampled in Kurtak (Siberia) and in Tönchesberg (Germany), without success; as for magnetic susceptibility, it deals with a selection of sequences from Siberia (Kurtak), Tadjikistan (Tagi Djar and Lachti), Central Russia (Zeleznogorsk), Central Europe (Dolni Vestonice) and Germany (Tönchesberg, Metternich and Wallertheim).

From the archaeological point of view, Middle Palaeolithic assemblages were encountered only in the German and Belgian sequences; their exploitation and integration in the north-western Europe system is undergoing, partly in co-operation with N. Conard (Un. Tübingen).

Presently, we have thus at our disposal a considerable data bank which constitutes the backbone of a future geotraverse of the Eurasian loessic domain for the Last Interglacial, the Early Glacial and the transition to the Pleniglacial period, and will also serve as a basis to establish long distance correlations (Figs 3 and 4). For this period the recorded successions tie up

around three complexes of climatic phases grading from temperate to very cold environments. The whole provides a pattern similar to the one of the Grande Pile (NE France), and to that recorded by B. Van Vliet-Lanoë in the loess of NW Europe.

#### 4.2. *Second half of the Upper Pleistocene (I.R.S.N.B., Un. Liège and Un. Gent)*

An other example of a joint utilization of the expertise of each team is the Archaeology - Natural Sciences connection established between the I.R.S.N.B. "Natural Sciences" team and the Université de Liège. The starting point of this co-operation was a parallel and complementary study of large Upper Palaeolithic open air settlements in Central Europe (for instance, Willendorf, Dolni Vestonice, Mitoc Malu Galben and Cosautsi) based, on the one hand, on their cultural and typological characters and, on the other hand, on their palaeoclimatic and chronological context. This study was subsequently extended to the principal Upper Palaeolithic sites of Central Russia, the Altai and the Yenisei Basin.

For each region the access to the most documented sites allowed the setting up of regional stratigraphic and palaeoclimatic sequences encompassing most of the period considered and recording each time complex successions of cold to rigorous episodes and phases of slight climatic improvement generally named by local names.

On the other hand, the degree of resolution degree of the sequences of the second half of the Upper Pleistocene proved to be impressive. It enabled the identification of episodes, the duration of which being close to one thousand years, that were very often reproducible on the scale of the Eurasian loessic belt. Such a detailed chronological frame could only be set up through a systematic <sup>14</sup>C dating strategy which was an other important goal of our programme (Fig. 5).

Presently, we have obtained over 100 new <sup>14</sup>C datings correctly defined and performed by conventional or AMS <sup>14</sup>C dating in the Groningen laboratory, the reputation of which is internationally admitted, usually on very carefully selected anthracological samples to minimize the

risks of pollution. Most of these datings are distributed among the key sites of Central Europe (Willendorf, Mitoc Malu Galben and Cosautsi), Russia (Kostienki) and Siberia (Kurtak and Afontova Gora), this strategy allowing us also to assess the pertinence of the Russian <sup>14</sup>C datings from the Leningrad, Moscow and Novosibirsk laboratories.

Another fundamental aspect of the programme relates to the botanical environment and consequently to the collection of good quality organic material for <sup>14</sup>C dating. In this respect, F. Damblon's works have shown the interest of anthracology to reconstruct the plant cover of the loess formations, compared to palynology and carpology that proved in some exceptional cases uncertain. It is a fact that we now have a well-documented sampling of charcoals coming up from a dozen Palaeolithic sites which are representative of the Eurasiatic loess field and confirm the well-marked prevalence of coniferae generally dominated by spruce in the anthracological structures for the major part of the last glaciation.

Regarding the palaeontology of vertebrates, the contribution of the I.R.S.N.B. "Natural Sciences" team was tenuous. M. Germonpré achieved the study of the faunistic remains of the deposits of Kamenka (Baikal Area) and started a comparative study of the great vertebrates from Kostienki (Central Russia). Besides and again in the scope of this research programme, the malacology of 5 loess sequences from Central Europe was studied in detail; the analysis of the molluscs from Willendorf, Schwallenbach and Grubgraben was completed by Ch. Franck (Universität Wien) while those from Mitoc Malu Galben and Cosautsi are presently being analyzed in Kishinev (Moldavia).

From an archaeological point of view, these data become fundamental to understand the spread of the main technological and cultural streams between Central Europe and the Great Russian Plain during Upper Palaeolithic times. This approach was developed in close co-operation with the Université de Liège team, which has undertaken researches in the following countries : Belgium, Austria, Romania, Moldavia, Ukraine (Crimea) and Russia (Siberia). These researches were

mainly field excavations or test controls (led in collaboration with local teams), but also revisions of archaeological and faunal materials from previous excavations, or analyses of materials coming from field works performed by the I.R.S.N.B.; they concern mainly the sites of Huccorgne-Hermitage (Belgium), Willendorf II (Austria), Mitoc Malu Galben (Romania), Cosautsi (Moldavian Republic) and Siuren II (Ukraine).

#### **4.3. The Upper Pleistocene-Holocene transition (K.U. Leuven, I.R.S.N.B. and Un. Gent)**

A similar approach was foreseen for the Late Upper Palaeolithic with the project focusing more specifically on the hunting practices and strategies of the Hunters-Gatherers of the central part of the European plain during the Late Glacial, mainly for what the Federmesser industries are concerned. Two important Federmesser settlements were selected for the study of the hunting practices: the Siedlnica settlement in the small Kopanica Valley (between Poznan and Wroclaw, W Poland) and the Rydno ochre mine complex (between Warsaw and Krakow in SE Poland). The outcome of this research was exceptional in several ways : first of all, a new rich Hamburgian concentration (SIE-I/95) was discovered. Although the Kopanica valley belongs presently to the isolated eastern periphery of the Hamburgian roaming region, the find of a fourth concentration in the valley (Siedlnica 17a, Olbrachcice 8, and maybe Siedlnica 33) provides us with the first hints that this valley might have functioned as an aggregation zone for specific subsistence or social activities.

Finally, the new Hamburgian finds might offer on a larger geographical scale new clues on how to look at the cultural variability within the Hamburgian. The eastern and north-western border areas of the Hamburgian occupation zone, e.g., closest to the ice front, are crucial for taxonomic and settlement pattern studies. The recent progress made in southern Scandinavia with the discoveries of the Hamburgian sites of Jels, Slotseng, and Sølbjerg is also observed on the Polish territory. Five excavated sites - Olbrachcice 8, Siedlnica 17a, Siedlnica 17-I/95, Liny, and Mercov Rogów Opolski, Liny and Markowice - mark the Polish eastern

periphery of the Hamburgian exploration zone. They finally offer a required minimum of data to discern the functional, cultural and/or chronological variations. The Hamburgian occupation in Central Europe might have been much more substantial than assumed.

However, as the K.U. Leuven team concentrated on the technological and functional aspects of the industries concerned, the chronostratigraphic positioning of the studied concentrations has not been worked out. Nevertheless, even if a late attempt to study the sites of the Kopanica valley in collaboration with the I.R.S.N.B. and the Un. Gent was not really fruitful, the Kopanica valley has the potential to answer to this problem and further prospections should supply new interesting data.

#### **4.4. Anthropological aspects (I.R.S.N.B. and Un. Liège)**

The contribution of the I.R.S.N.B. "Anthropology" team, which at the beginning appeared beyond the central call of the project, has nevertheless been integrated harmoniously into the whole. In particular, the setting up of the complete version of the catalogue of the fossil Hominid remains of Czechoslovakia constitutes a fundamental element : firstly, because this region is rich in human material and, secondly, because it is the only Central European region that has not been exploited from this point of view yet. A complementary aspect of the anthropological study aims to develop some biochemical analyses of bone such as palaeoimmunology, ancient DNA studies and X-ray diffraction analyses of the bones. These studies required a long period of preparation and are on the point of being applied to the analyses of bone material from Upper Palaeolithic settlements.

## **5. CONCLUSIONS**

Globally, the overview of the progress situation of the different work teams shows that they have met the essential of the project's objectives with nonetheless some distance concerning the initial programme. In the present state of

advancement, almost all needed data were gained.

Concerning geology, these data have provided a firm chronological and chronostratigraphic framework for the main climatic events that occurred during the Upper Pleistocene. In addition, long distance correlations taking into account reliable previous dates could be proposed for the first time between north-western Europe, Central Europe and Siberia via the Central Russian Plain (Figs 3 & 4). In this perspective, the data gained in the framework of the Sc-004 programme demonstrate the large scale and continental significance of the climatic events that are recorded in the Eurasian loess deposits, as accurately as in the Greenland ice record. The data also represent a major contribution to the understanding of the evolution of the climate and environment during the Upper Pleistocene in the frame of a "Global Change" approach.

In this perspective the contributions of the individual archaeological contexts could be integrated into a real cultural vision according to the successive occupation modes over the Eurasian loessic plain during the Upper Pleistocene. It allows to recognize various stages of evolution within the Aurignacian, Gravettian and Late Upper Palaeolithic industries. These propositions will be viewed in the context of our current knowledge and revised as new data become available. Their presentation here, however, highlights the substantial contribution of the SSTC funded research; these propositions question the perspectives which were up to now limited by their regionalism and opens new paths of research and insight into European prehistory. This synthesis concerns the main sites on which the Un. Liège and K.U. Leuven teams have been working on, but also others sites with an important archaeological background (Dolni Vestonice, Kostienki), which were studied from a stratigraphic or palaeoenvironmental point of view.

Finally, further interactive working out of this large set of data will lead for sure to much more outstanding results with large complementarities and connections regarding various topics related to the evolution of Man and its environment in the Great Eurasian loessic plain during the Upper Pleistocene.

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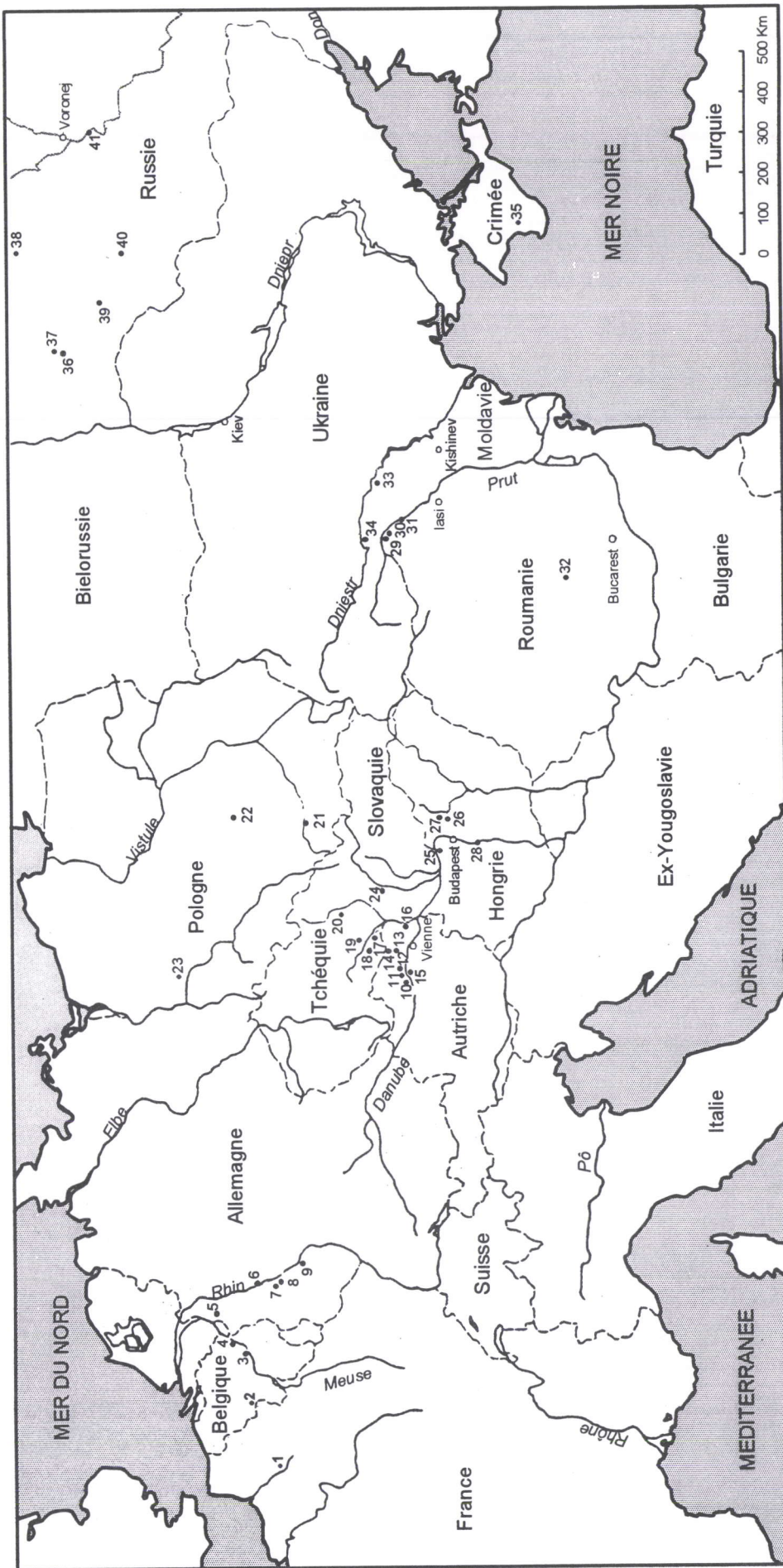


Fig. 1: Location map of the sites in Europe

N.W. France; 1 : Saint-Saufieu and Somme Valley. Belgium; 2 : Harmignies and Maisières-Canal; 3 : Huccorgne; 4 : Remicourt, Rocourt and Kesselt. Germany; 5 : Rheindahlen; 6 : Ariendorf; 7 : Tönchesberg; 8 : Metternich; 9 : Wallertheim. Austria; 10 : Willendorf and Schwallenbach; 11 : Stratzing; 12 : Grubgraben; 13 : Alberndorf; 14 : Hollbrunn; 15 : Göttweig-Paudorf; 16 : Stillfried. Czechia; 17 : Dolni Vestonice, Pavlov and Milovice; 18 : Vedrovice; 19 : Bohunice and Stranska Skala; 20 : Predmosti. Poland; 21 : Spadzista and Brozkvinia; 22 : Rydno; 23 : Siedlnica. Slovakia; 24 : Morovany. Hungary; 25 : Basaharc and Pilismarot; 26 : Mende; 27 : Tapiosüly; 28 : Paks. Romania; 29 : Crasnoleuca; 30 : Mitoc Malu Galben and Mitoc Pirul Lui Istrati; 31 : Ripiceni; 32 : Pestera Ciorei. Moldavia; 33 : Cosautsi. Ukraine; 34 : Molodova; 35 : Siuren. Russia; 36 : Briansk and Suponevo; 37 : Khotylevo; 38 : Lichvin; 39 : Zeleznogorsk; 40 : Avdeevo; 41 : Kostienki.



Fig. 2: Location map of the sites in Central Asia and Siberia

**Tadzhikistan; 42 : Tagi Djar, Derai Kalom, Obi Mazar, Lachuti and Kuldera. Altai; 43 : Kara Bom; 44 : Ust Karakol and Denisova Cave. Middle Yenisei Basin; 45 : Kurtak; 46 : Afontova Gora and Listvenka. Transbaikai; 47 : Kamenka.**

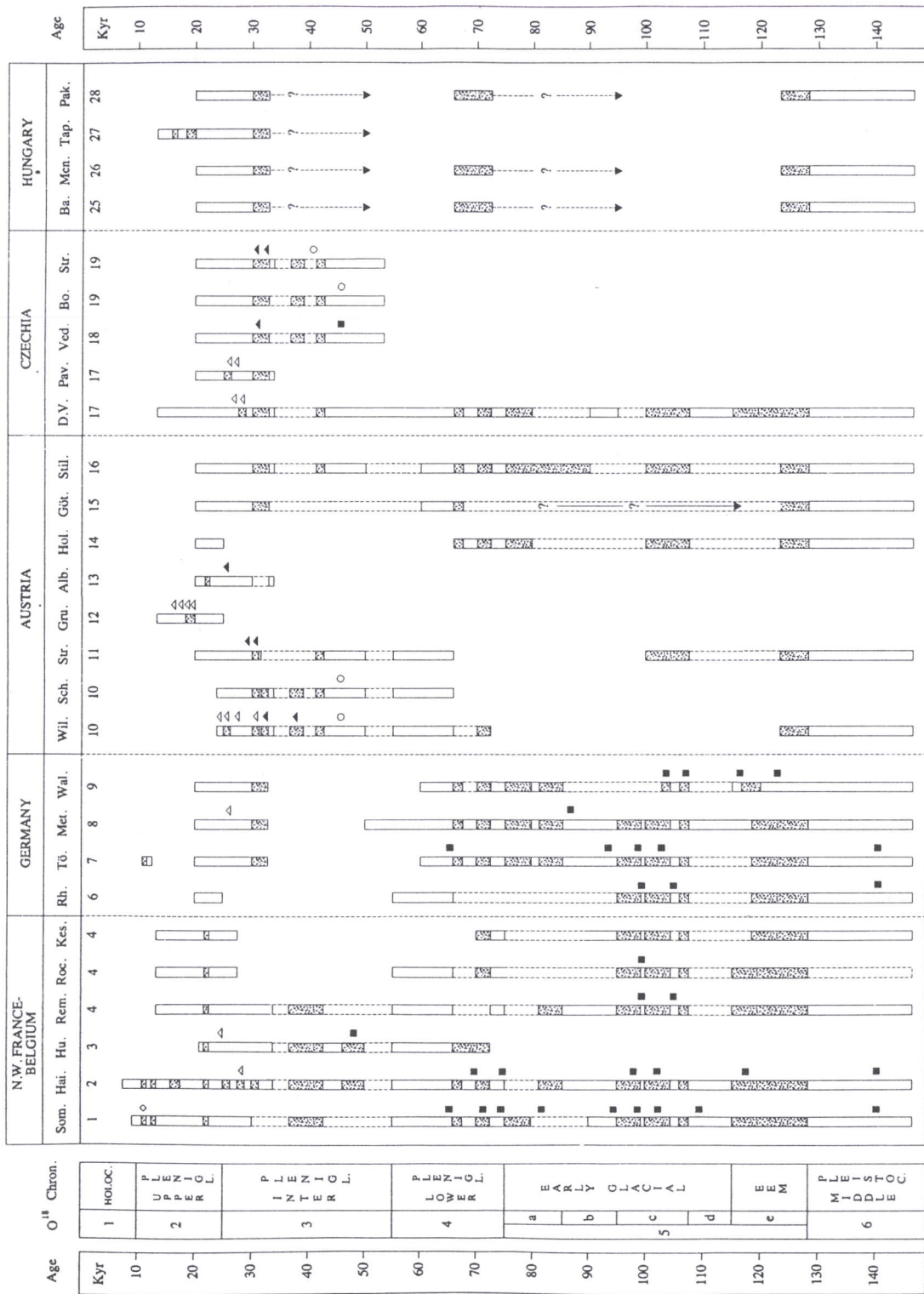
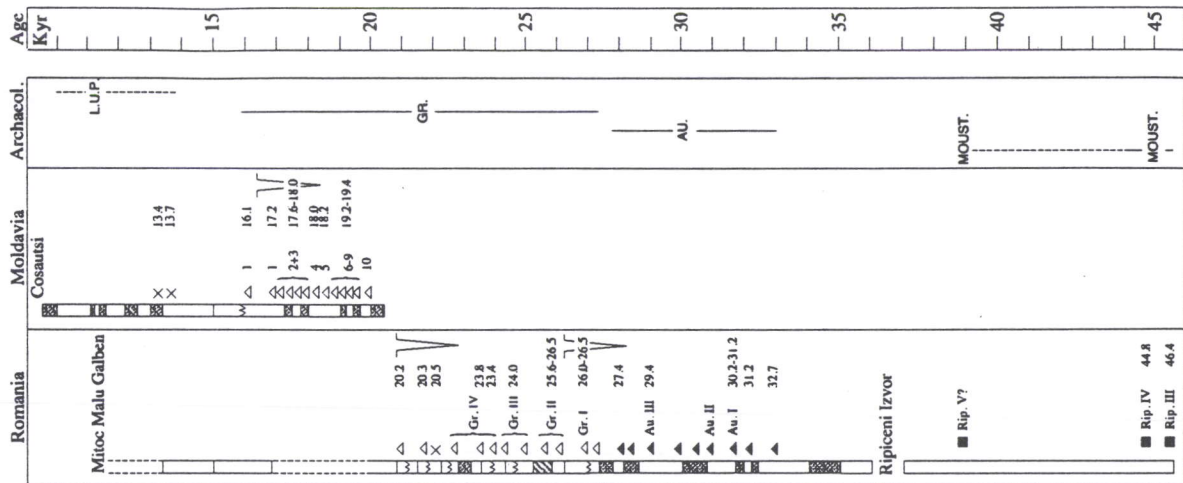


Fig. 3: Geographical distribution of the stratigraphic and archaeological sequences studied in the frame of the Sc-004 project (NW Europe and Central Europe)

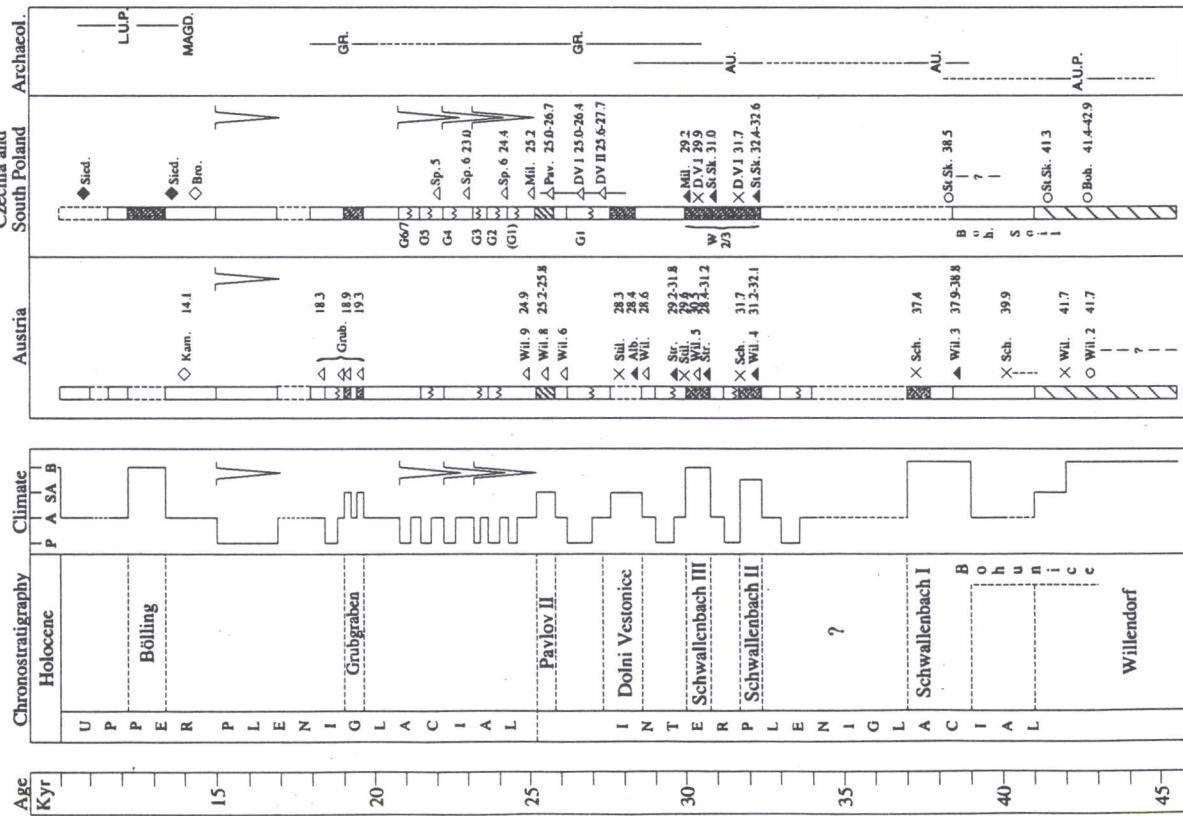
Graphic symbols: Archaeological assemblages; ◆ : Late Upper Palaeolithic; ◇ : Magdalenian; △ : Gravettian; ▲ : Aurignacian; ○ : Archaic Upper Palaeolithic; ■ : Mousterian. The dotted sections represent paaleosols. The numbers and shortenings above the columns refer to the location maps.



EAST CARPATHIANS



CENTRAL EUROPE



P. Haesaerts, 1998

Fig. 5: Distribution of the palaeolithic assemblages and 14C dates (Groningen dates) with regard to the chronostratigraphic sequences of Central Europe. Shortenings. Climatic environment. P: permafrost; A: arctic; SA: subarctic; B: boreal. Sites: Austria: Kam: Kamegg; Grub.: Grubgraben; Will.: Willendorf; Stl.: Stillfried; Alb.: Albernorf; Str.: Stratzing; Sch.: Schwallenbach; Poland: Sied.: Siedmica; Bro.: Brozkvina; Sp.: Spadzisa; Czechia: Mil.: Milovice; Pav.: Pavlov; D.V.: Dolni Vestonice; St. Sk.: Stranska Skala; Boh.: Bohunice. Archaeology: LUP: Late Upper Palaeolithic; MAGD.: Magdalenian; GR.: Gravettian; AU: Aurignacian; AUP: Archaic Upper Palaeolithic; MOUST: Moustertian.

