

History from the Earth: Meanings, Methodological Aspects and Aims

Archaeology aims at the individuation and exhaustive interpretation of artifacts and marks of the environmental transformations made by man to realize the complete and full historical reconstruction of material and cultural aspects of the human society with reference to a certain time and place: the last one is actually our place of research.

Artifacts and marks are the means through which we can get in touch with the protagonists of that human society we are trying to survey and to reconstruct. Its way of living and its cultural forms are the necessary basis to understand ours deeply as, today, we are the result of the many different human experiences to which that society we are surveying has surely given its tribute.

If we set these aims as our main purpose it will be clear that the complete and full reconstruction will not take place if the basic data are collected by chance and their interpretation is widely interpolated. We can appreciate how the collected items look like, but this is not so important as their contribution to the historical reconstruction which require all the available data to be complete. These data – that is artifacts and marks of the environmental transformation made by man – are the remains of the human presence on the territory, that is the discards of the daily life, of the production and commercial activity, otherwise left as a necessary consequence of abandoned settlements or of catastrophic events caused by nature or by man.

All this is included in the upper levels of our planet, wherever human settlements can be found, in very different ways and density according to the production ability and the intense and general use of natural resources or artifacts made by the settled society. This means that the territory is also a big container of all those evidences left by the human society settled there but it is also the supporting cultural space of present and past societies, settled on the territory.

Starting from this consideration we have to assert that the study and the survey of the territory to identify the human presence in the past is the necessary presupposition of the main territorial activity of the archaeologist: the excavation. Recognition has become more and more the essential part of archaeological research and the most suitable way to realize it has been, and still is, the most important element of its methodology.

The methodology has actually been developed greatly in the last decades and the tribute of statistics and computer science have enabled big progress. But these last improvements cannot get rid of the two conditioning components of direct recognition: the limiting conditions to the movements over the area especially when, as it usually occurs, the area to survey is very large and the possi-

bility to survey and take note of only those traces on the surface which are usually scant of past societies.

Since the beginning of this century we can say that the research on the field has actually been supported very much by aerial photography, especially by the possibility of interpreting photographs taken from an elevated, not very high, platform of the surveyed area. We are talking of interpretation because, beyond the synthesis obtained by an aerial view of the surface, we can also get information by those marks connected with human artifacts buried in the soil taking into consideration the varying humidity and vegetation references.

These are the marks which are recognized and underlined by the expert eye of the interpreter, whose correct acquisition and explanation of the photographs are strictly linked to his ability.

To those human interpretation "limitations" we have to add the important fact that the marks are related to artifacts buried close to the surface. This means that the essential condition to obtain good information is that the amount of discards is near to the surface and the surface itself has not been changed much, if we think of the natural stratification of discards left by humans. For example, agricultural use of the territory can confirm this explanation only if the interventions are little and not much influencing the territory itself, otherwise every possible superficial sign could be cancelled.

Later we shall see how the aerial photograph is used in a new way according to the operating process of remote sensing which is actually very important to get precious documents before those transformations, due to sophisticated means, but obstructing a sure interpretation of all the past use of the territory.

Our need to collect systematically the information on the past human presence in the surveyed area, within geographical and historical limits, would not be satisfied, or only partially satisfied without assuring the necessary base for the historical reconstruction as we need real improvement of the research quality.

The introduction and the diffusion of multispectral images, and especially of those taken from orbital platforms, have definitely changed our possibility to know better the resources of our planet and also that particular section intended for the study of the territory concerning the anthropized areas and, finally, for archaeological research.

We can, actually, receive a wider range of wavelengths of the energy reflected and emitted by earth, so that we are able to acquire not only everything on the surface, in connection with the wavelengths received by the human eye, but also under the surface. What we see can be a typical natural feature of the surveyed soil, but it can also represent discards or accumulations gradually formed on the terrestrial surface as a consequence of human activity. The distinctive feature of these accumulations is the regular patterns designed by the variations of the emitted energy quantity.

This means a possibility to acquire information, by simple selection, when interpreting the image, on everything contained in the soil and due to human activity. All this information is shown on the same level: but we have consequently to explain it within a reconstructing frame.

Our discoveries are no longer adventurous and accidental but are now the result of the analysis of everything that man has left. We have to distinguish, by logical process and by using other analytical methods of the territory, those links connected with the different information, in order to restore the sequence that is usually shown by excavation in the stratigraphy.

We can now use those advanced methodologies for direct recognition and cataloguing of the already available knowledge, to obtain a sure frame of the spatial distribution, that is what I call the "previous knowledge".

Some of the reports presented during this conference have given very satisfactory and interesting examples of how we can organize what we already know to advance our knowledge of the past.

I have talked about multispectral images without specifying what a platform is: the most known available platforms are the orbital ones that is the satellite images which will be later explained in detail. Their first great tribute to the historical study of the territory is the synthesis of an area within geographical and historical limits. This synthesis has given us the possibility to find out the real marks of the human presence on territory from distant to recent times, that is the settlements intended as the relationship of man-territory.

For the archaeological aims the orbital images are presently used on more occasions, but, almost always, as an extension of the interpretation of the aerial photographs. I would like to underline how useless and expensive it is not to use such an important instrument taking full advantage of the most advanced, and still developing possibilities it offers for scientific research in order to get the best results.

The new aim of the methodologies and procedures we want to propose is that they exploit, in the best way, the possibility of the means of giving the most satisfying answers.

We think that this can be obtained by the procedure, we have decided, consisting of the use of work stations with a big memory and capable of dialogue with many peripherals, for a total interpretation of the orbital images: these are selected, for the chosen area, on the basis of the best quality and visibility and data, close to the times when, for the natural evolution, we can have the greatest difference both for reflection and especially emission of energy. In other words in spring and autumn rather than summer or winter.

When we try to interpret, through treatment to underline some marks, it is possible to find out areas whose forms are incoherent or different, from the superficial organization. These can be referred, as they are regular, to human interventions under the actual surface and related to all the discards of past accumulated presences which have been gradually buried during times.

These surveyed areas are carefully studied and interpreted for their intrinsic features by connecting and comparing them with the cartography of previous information as you will hear later on, following the main ideal guiding thread for the human settlement, the orientation. We have now set the first interpretation of the human presence on the territory which has to be controlled, organized and defined by a series of operations to be carried out on the field.

First of all the georeference: this is made, for a first approximation, on the existing cartography and then by a considerable series of ground points by means of a GPS, which is an essential operation to assure the correct identification of how all the surveyed areas actually are and to use those images taken from low altitude to superimpose them to the satellite images so that we can obtain the most detailed resolution of those areas that are so important to a settling system.

Thus, we are able to start the comparison, which is so important for the success of our research, between the control on the field and the reading and interpretation of the image; all these operations cannot be unified in only one intervention: it becomes a dialectic, carried out for a certain time, between the field observations and the laboratory processes.

While going on with the detailed acquisition, the topographical points become more and more important, so that we can get large and largest scale plottings of the most interesting structures.

As regards the inserting of images taken at lowest altitude we have to mention two kinds of images taken from an aerial platform. On one hand normal aerial photographs covering the involved area: as in many regions we can dispose of aerial photographs taken sixty or more years ago as they give a precious series of acquired data belonging to previous times, that is before the most recent transformations of the territory. Though they are only photographs and are not multispectral they can nevertheless provide us with information concerning past and

lost documents that are precious for the reconstruction. We have got some interesting examples explained in some reports during this conference.

Nowadays we can get multispectral images from multichannels sensors on aircraft. This means that we can have images taken, between 1000 and 500 metres, at a highest resolution. We began to use MIVIS images; later they will be shown and explained, because we have started research aiming at the discovery whether so different and many channels can bring us to distinguish the acquired information according to the nature of the artifacts or their stratigraphical location. At the moment it is being studied and is only a research programme and we are not able to give you any result.

The interface of photogrammetric surveys and thermal images at the highest resolutions can take place from a platform at very low altitude, about 200 metres, expressly set up by Centro Scavi di Torino. It is a ULM aircraft carrying a photogrammetric camera and a thermal camera in parallax, as well as a normal tele-camera and a GPS antenna in a coaxial position with the centre of the taken image. The images are transmitted to control monitors in order to check the integral covering and the implementation of the flight plan. Thus we can obtain plotting at a scale 1:50 and, if necessary, at larger scales. We hope to show you tomorrow a demonstration of how this equipment works.

The ground control can be now very precise and is better realized, together with the direct recognition, through the geophysical detection, allowing a further deepening and reading which can indicate a human presence on the field but which can also give suggestions about its nature. The electronic elaborations and the computerized tomography also offer the possibility to obtain precious stratigraphic information.

These last ones are especially clear through mechanical detections that is the undisturbed core drill sampling we have successfully tried by freezing the soil.

I cannot now speak outside the theme of remote sensing: it could require another workshop. The micro-excavation we can obtain by core-drill sampling also opens the application of that essential aspect of the systematic land approach, the so-called "biological archive", the complete study of all the human, animal and vegetal remains, so that we can reconstruct the environment where man has lived as well as his quality of life.

All this huge and complex data get into a computerized databank we can use every time to obtain thematic maps according to the specific field of a research; the scale of these maps can be built according to the extension of the available information.

In conclusion: what is the meaning of what we have said on archaeology? no longer a conclusion, it is a series of obtained results to be presented and discussed, it opens a new frontier. The big amount of data that the systematic land approach enables to acquire is a challenge, on one hand, and a certainty, on the other: it is a challenge because we are totally engaged to interpret, to organize and to reconstruct data; it is a certainty because we are sure that our efforts are concentrated on all the available data, so it has a holistic feature that could not be possible before. Will archaeology of the 21st century win the challenge and get certainty? I really think so.

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