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VIRTUAL ARCHAEOLOGY

(Methods and benefits)

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(эффективность методов)

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CYBER-ARCHAEOMETRY FROM CYBER-ARCHAEOLOGY: NEW DYNAMIC TRENDS IN ARCHAEOMETRIC TRAINING AND RESEARCH

A modern approach to cultural education and archaeological sciences is presented with the use of new technologies: from virtual archaeology in cyber-archaeology and cyber-archaeometry. Virtual archaeology is mainly visual, static, with graphics and orientated to photorealism (Reilly 1990). Recently, new approaches have been added using various interactive practice. The 3D modeling is a very useful practice for the identification, monitoring, conservation, restoration and enhancement of archaeological objects. In this context the 3D computer graphics can support archaeology and heritage policy, offering scholars a “sixth sense” for the understanding of the past, as it allows them almost to live it. CA is the digital management of much partial information in the field. It is not necessarily visual, but dynamic, interactive, complex, autopiitic (self-organized) (Maturana, Varela 1980) and not necessarily oriented to photorealism. The past cannot be remade, but could be simulated. The CA is the process of simulation and reconstruction of archaeological finds or cultural materials. The archaeology of the third millennium is able to process, interpret and transmit much more data and information relative to the last two centuries. Cyber-archaeometry (Cam) is the digital IT process of simulation, restructuring and management of archaeometric processes from the field of natural sciences in relation to material culture, investigated variously (dating, prospection, analysis, technology, provenance, archaeoastronomy, etc.), either as optimum recruited image or as targeted research quest (Liritzis 2014). For example, the representation of the hydration process of obsidian in a nanoscale is first pre-educational in order to understand the mechanism of hydration on several sources of obsidian from different environments through an optical language. The 3D cyber-presentation of dating with obsidian hydration essentially planning the network of interpretation codes (mathematics: algorithms, equations) and the diffusion time, otherwise it is misunderstood in a linear sequence (spatial, temporal or oral presentation). If this cyber era is seen as a retrospective concept, one has to compare the two approaches in the development of digital archaeometry from archaeological procedural (processualism) in post-procedural thinking, in order to achieve the analysis of hybrid forms of both approaches, achieved by procedural tools (statistical analysis and quantitative methods in different fields, mathematics,

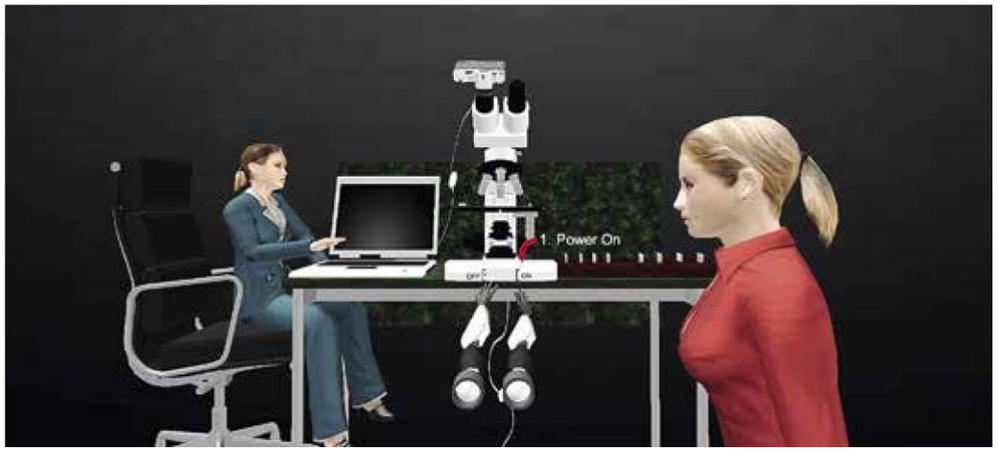

Fig.1.
Full online demonstration of optical polarised microscope and mineral identification.

geography, archaeometry, anthropology, archaeology and related disciplines). The above is an example of the emergence of cyber-archaeometry.

Virtual Environment, VE; Virtual Reality, VR; Massively Multiplayer Online World MMOW (Virtual Worlds); Augmented Reality, AR; immersive archaeology, Gamification and Serious Games are animation or 3D representations as simulated or real-time images with strong applications in cultural assets.

A first contact with cyber-archaeometry has started with the simulation of a petrographic (optical) microscope with the use of avatar in the time-space frame of the laboratory, and we navigate, explore, control the learning outcomes in connection to the archaeometric multisystem work.

3D virtual lab – educational aims – anticipated results

- Execution of laboratory exercises from internet via browser;
- making a virtual lab for education of university students (e-learning or from distance) without physical presence;
- learning the functioning of lab instruments for archaeometric work;
- enabling students to discover knowledge through these processes, but also to inter pret in their own way the laboratory results.

Ongoing example

- 3D simulation of water diffusion phenomenon in amorphous glass (obsidian);
- from Fick’s law to the dynamic molecular physico-chemistry in the time-space do main;
- from the empirical to phenomenological and the scientific model of diffusion mech anism in the hydration dating method of obsidian.

Some benefits in training on a virtual environment

- Taking place any time without help from assistants of the lab;
- cost savings;
- avoiding disasters and loss of material;
- it can be repeated many times;

• partial steps can be repeated, giving students the opportunity to analyze the process from different perspectives and opinions.

The development of the application is made with the 3D Modeling and Game Engine Unity3D as well as on purpose designed algorithms.

Learning outcome for the optical microscope

• Recognizing content of thin sections (minerals, organic matter, scrap fragments, min eralogical structures etc);

• wide spectrum of archaeo-materials;

• trial & error;

• targets: analytical reflection;

• functioning of equipment;

• familiarization;

• synergy, teamwork, understanding.

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