10 - Investigação Analítica em Arte Rupestre

Analytical Rock Art Research
La recherché analythique de l'art rupestre
Investigación Analítica del Arte Rupestre

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PAPERS

Applications of Digital Image Processing to Rock Art Documentation
Robert Mark & Evelyn Billo, Estados Unidos da América

We will present methods of digital image enhancements with techniques applying alternate color spaces and channels in Adobe Photoshop and, decorrelation stretch algorithms with DStretch. We will also present techniques using image stitching of high resolution mosaics and panoramas. Several examples that reveal elements not visible in the original photographs will be shown from sites in Bolivia, Peru, and the southwestern United States.

Calcite Formations on Prehistoric Paintings: The Case of the Large Cave of Arcy-sur-Cure (28000 – 24500 BP, Yonne, France)
Ina Reiche, Michel Menu, Emilie Chalmin & Geneviève Orial - França

Different types of calcite coming from the Large Cave of Arcy-sur-Cure have been investigated on a physic-chemical and microbiological point of view to determine the most important factors involved in their formation, to find out the precipitation mechanisms and to evaluate the role of micro organisms in their formation. A large panoply of microscopic and spectroscopic – also involving synchrotron based methods – as well as methods of classical and molecular biology were used in this issue.
The comparison of structural, morphological, chemical and microbiological features of natural calcites sampled in the cave with those obtained by synthesis under various conditions (with or without bacteria, variation of the saturation index, CO_2 pressure, presence of pigments or calcite growth inhibitors) allowed a better understanding of the role of each of these parameters. A precipitation process for each type of calcite from the wall (opaque and translucent) could be determined. The interaction between calcite and prehistoric paint layers could be evaluated, the conservation measures taken for the prehistoric rock art validated and further recommendations expressed.

Rock Art of The Parque Nacional Cavernas do Peruaçu, Minas Gerais, Brasil. Materials Identification
Helena David - Brasil

The Parque Nacional Carvernas do Peruaçu is located in the left edge of the São Francisco river, in the north of Minas Gerais, 620km of Belo Horizonte. It presents an exceptional concentration of

archaeological sites and is marked, over all, for the presence of decorated walls in the caves entrances and shelters under rock. With the aims to identify the materials constituents of paintings simulations had been made, that after accelerated aged, had been analyzed and compared with real samples. The gotten results evidence the presence of organic substances of animal origin, possibly used as binder of the prehistoric paintings.

Arte rupestre y ocupaciones del Holoceno tardío en la Patagonia andina (Comarca Andina del Paralelo 42º, Argentina)
Elena Tropea & Anabella Vasini - Argentina

We will present the results of the analysis of the rock art representations of sites corresponding to the late Holocene (2.000 years BP in forward) located in the Comarca Andina del Paralelo 42º, that includes the ecotonal zone forest - steppe of the Patagonian Andes, inside argentinian territory. Using the microscopical analysis of samples of mineral pigments and of accretions from the rocky support, we will establish a correlation between the events of execution, production and later transformation of the rock paintings by the levels of excavation and archaeological material recovered in the Region (Cholila's and valley of the Manso river´s sites), in order to define the most late sequence of the rock art and pre and post hispanic regional.

In Situ Pigments Study of Rock Art at Jaguariaíva 1 Archaeological Site (Paraná, Brazil) by Portable Energy Dispersive x-ray Fluorescence (edxrf)
Carlos Roberto Appoloni, Francisco José Lopes, Fabio L. Melquiades, Wislley Dueli Silva e Cláudia Ines Parellada - Brasil

Jaguariaíva 1 rockshelter is located in the Jaguariaíva city region, Paraná State, Brazil (17x 21x5.20m size and 887m high). It is a sandstone shelter with paintings from, at least, two different periods. The oldest one is around 7.000 years BP. Rock art in the Jaguariaíva 1 shelter is on part of two walls and ceiling, from 0.5m until 1.90m high at west side, and from 1.80m to 3.60m at north side. The main documented panel of the rock shelter has paintings of animals and lattice motifs. The oldest ones are deer figures infilled with red. The more recent are reddish brown outline figures filled by straight lines. Rock art regions were analyzed by two portable EDXRF systems, one employing an X-ray tube with Ag filter and target and another one with an X-ray tube with W target and Ag filter, both with Si PIN diode detectors and a special designed mechanical system for the detector and X-ray tube positioning, that enables angular and XYZ movements of the excitation-detection system respect to the measurement area. Elements from Si to Pb were measured. X-Ray Fluorescence spectra were analyzed using the AXIL-WinQXAS software.

Análise Mössbauer de pigmentos de pinturas rupestres de seis sítios arqueológicos do Estado do Piauí, Brasil
Luis Carlos Duarte Cavalcante, José Domingos Fabris & Maria Conceição Soares Meneses Lage - Brasil

The ^{57}Fe Mössbauer spectroscopy was used in this work on the chemical characterization of pigments from prehistoric rupestrian art. The measured hyperfine parameters for samples of materials collected from red paintings are typical of hematite with small particle sizes. Other oxide superparamagnetic compounds, including goethite, were also detected. This kind of analysis implies several experimental difficulties, particularly due to the complex chemical composition and to the exceptionally small amount of samples commonly available for manipulation in the laboratory. Despite of this the chemical-mineralogical characterization has shown stimulating evidences and detailed information about the mineralogical nature of these pigments.

Caracterização químico-mineralógica das pinturas e eflorescências salinas do sítio de arte rupestre Pedra do Castelo, Piauí, Brasil
Luis Carlos Duarte Cavalcante, José Domingos Fabris & Ma. Conceição Soares Meneses Lage – Brasil

Caracterização químico-mineralógica das pinturas e eflorescências salinas do sítio de arte rupestre Pedra do Castelo, Piauí, Brasil. O Sítio Pedra do Castelo é uma gruta com grafismos puros e geometrizados, em diversas tonalidades de vermelho, e gravuras rupestres nas paredes, teto e assoalho dos abrigos. A caracterização químico-mineralógica das pinturas e eflorescências salinas, neste trabalho, foi obtida por (i) espectroscopia Mössbauer de ^{57}Fe, (ii) espectroscopia de energia dispersiva, (iii) microscopia eletrônica de varredura, (iv) difratometria de raios-X e (v) fluorescência de raios-X por energia dispersiva. Os resultados indicam que os pigmentos das pinturas foram preparados com hematita e que as eflorescências salinas consistem essencialmente de $MgHPO_4!3H_2O$, $H_6K_3Al_5(PO_4)_8!18H_2O$, $KAl(SO_4)_2$, $KAl_3(SO_4)_2(OH)_6$ e SiO_2.

Technology of the Pigments Production in Colombian Rock Art: Materials and Alterations
Judith Trujillo, Pierluigi Rosina & Luiz Oosterbeek - Colômbia/Portugal, Itália/Portugal, Portugal

There have been introduced new aspects in the research process concerning the materials present in these rock art works and leads up to the works about technology of pigments in the studied area, extending the descriptive possibilities of the conservation conditions of rock art. The study of the materials opens a route towards the conservation work, and constitutes an essential way for the projected studies on dating. In this work, pigments, some accretions, the rock substrate and the possible raw material of the rock art paintings, were analyzed.

Methodological Postulates for an Approach to the Production Techniques of Petroglyphs: Between Corporality, Gesture and Technique
Francisco Vergara Murua - Chile

During the last decades there have been important advances in the understanding of rock art production technologies. However, most of them have focused on the procedures for paint production or in the instruments to carve the images. In this presentation however the methodological approach used is oriented towards the process of production of rock art engravings through a study of the grooves. This methodology that began from a sequence of experiments and analogies developed by the author is now used to define technological characteristics in rock engraving production in order to contribute to the definition of particular styles in the Semiarid North of Chile.Through this methodology the understanding of technological processes implicit in the stage of figure production is sought. As this process has not received enough attention in archaeology and constitutes an intrinsic variable of the final form, the methodological application is presented through a case study where rock art had been defined as homogeneous; this is site Los Mellizos, in the Semiarid North of Chile.

Microanalyse de peintures rupestres d'Afrique du Sud – Implications pour la conservation
Stéphane Hoerlé & Loïc Bertrand - França

L'Afrique du Sud abrite un riche patrimoine d'art rupestre, attribué pour partie aux chasseurs-cueilleurs Bushmen. Le développement de mesures de conservation efficaces pour protéger cet inestimable témoignage de l'histoire des Bushmen demande une connaissance préalable des matériaux qui composent les peintures, des accrétions et de leurs altérations. Des études de caractérisation et de microanalyse physicochimiques menées sur des microéchantillons (microscopie optique, microscope électronique à balayage / sonde EDS, Raman, FTIR-

Synchrotron) révèlent des informations nouvelles sur la composition et la structure des couches de peintures et des accrétions.

The Role of calibrated Colorimetry in Rock Art Science
Robert Bednarik - Austrália

The possibility of using colorimetric data obtained from rock art has been considered for almost as long as rock art has attracted the interest of researchers. Yet the apparently intractable obstacles to its analytical use have deterred sustained interest, among them the perceived ambiguities in repatination processes. Very recently this topic has been investigated and surprisingly consistent data have been secured from rock art in various parts of the world, especially after repatination of a series of engraved dates had been calibrated colorimetrically. While this method still remains in its infancy it does offer some very attractive features. In particular, it requires only inexpensive and readily available equipment, yet it provides excellent practical applications in various areas, especially in rock art monitoring, conservation and related fields, and first indications are that it can be of considerable utility in rock art dating as well.

Vilavilani Rock Art. Study Of Technological And Cultural Evidence In The Central Andes.
Mónica Suárez Ubillus - Peru

We researched the site called "El Canido", which is a rocky formation located in the southwest part of Peru, through a series of archaeological excavations and the analysis of picture samples oriented completely to the application of archaeometry techniques, which up until this moment haven't been used too much in the studies of Peruvian rock art. Such analysis have allowed us to infer important chronological results, as well as spatial associations, that are essential to the comprehension of the diverse technological and cultural aspects that are used for said people allowing us at the same time to propose a relative chronology for the images portrayed inside the rock formation, and to establish some cultural associations with other sites.

Microscopic Analyses Of Wildfire Damage To Petroglyphs
Alice M. Tratebas Reino Unido

Microscopic studies of rock coatings overlying petroglyphs show that wildfire damages rock art in ways not visible to the eye. Samples of rock coatings collected before and after wildfire damaged a major petroglyph site provide a unique data set for analyzing fire effects. Analyses showed that the fire fractured quartz grains in the rock substrate, spalled through varnish layers into the underlying substrate, spalled weak areas within varnish, and spalled the surface most layers of rock coatings. In addition, ash deposits bonded to the rock surface. Analyses showed that microspalling and ash can affect experimental dating of rock coatings. Both also reduce the potential for long term preservation of petroglyphs.
