‘Back to Nature’ in Conserving Museum Artefacts: Developing a methodology for the investigation of stone consolidants

Booth J.

School of Geography and the Environment, OUCE, South Parks Road, Oxford, OX1 3QY, United Kingdom, jennifer.booth@ouce.ox.ac.uk

The British Museum has a large collection of stone artefacts, including limestone sculptures, from a range of geographical and historical sources. Many of these artefacts are deteriorating and exhibit structural decay, friable or delaminating surfaces, and complications involving soluble salts. The conservation of these artefacts is essential if they are to survive for future generations. Often conservators endeavour to alter a given artefact as little as possible, favouring preventative methods. However, in cases where decay progresses to a serious state where significant portions of an artefact may be lost, more interventive conservation methods may be sought.

The Back to Nature project is a Collaborative Doctoral Award between the University of Oxford and The British Museum. Funded by the AHRC, it is investigating two newly developed techniques; CIPS (Calcite in situ Precipitation System) and Calcium Oxalate treatment, to assess the feasibility of their use within the field of heritage stone conservation. These treatments involve the application of inorganic solutions that react with the stone to produce a consolidant, a material to strengthen and hold an artefact together. These novel techniques mimic natural rock hardening and strengthening processes, and this investigation is situated within a general trend in the conservation field as a whole, to discover treatments that only introduce new materials that are compatible with the original artefact matter. CIPS and Calcium Oxalate treatment are being analysed in comparison with the group of more traditional organic consolidants known as Organo Silanes.

This poster presents the pilot study of the Back to Nature project. Designed with the broad aim of trialling the conservation treatments and to highlight any possible issues with the experimental design, there are two specific objectives of the pilot study. The first is to examine the difference in a select set of measurements between fresh and weathered stone samples. This will examine the importance of the source of sample material, and the issue of whether fresh stone samples can really provide an accurate substitution for artefacts that may have undergone thousand of years of weathering. The second objective is to determine the minimum number of replicates required for an adequate and meaningful comparison of consolidation treatments. The results of these two objectives will provide a basis for the methodology adopted for the Back to Nature research, enhancing the value and reliability of data obtained from future experiment essential to the project, and the results may have wider reaching consequences for the interpretation of data from other stone conservation investigations.

A Mesozoic to Tertiary geodynamic evolution of the southern Dinaric-Hellenic belt: the ophiolites as tools for its reconstruction

Bortolotti V.[1], Chiari M.[2], Marroni M.[3], Pandolfi L.[3], Principi G.[1] and Saccani E.[4]

[1]*Department of Earth Sciences, University of Florence, 50121 Florence, Italy, valerio.bortolotti@unifi.it, gianfranco.principi@unifi.it*
[2]*C.N.R., Institute of Geosciences and Earth Resources, 50121 Florence, Italy, marco.chiari@unifi.it*
[3]*Department of Earth Sciences, University of Pise, 56100, Pise, Italy, marroni@dst.unipi.it, pandolfi@dst.unipi.it*
[4]*Department of Earth Sciences, University of Ferrara, 44100, Ferrara, Italy, sac@unife.it*

With this abstract we try to schematically reconstruct a portion of the long story of the southern Dinaric-Hellenic, basing our effort on the complex tectono-stratigraphic evolution of the Dinaric ophiolites. First of all, we propose a new classification of the ophiolites cropping out in Albania and Greece that includes seven different types of occurrences, which correspond to different tectonic “units”. From bottom upwards they are: 1- the Sub-ophiolitic Mélange (SOM); 2 - the Triassic Ophiolites (TOP); 3 - the Metamorphic Soles (MES); 4 - the

Jurassic Ophiolites with MOR and SSZ magmatic sequences (JOa); 5 - the Jurassic Ophiolites with only SSZ magmatic sequences (JOb); 6 - the Supra-ophiolitic Mélange (UOM); 7 - the Jurassic Ophiolites with BABB magmatic sequences (JOc). The features of these ophiolites (stratigraphy, geochemistry, tectonic setting and age), the same all over the southern portion of the Dinarids from Albania to eastern Greece, strongly suggest the existence of a single ocean located east of the Adria/Pelagonian continental margin: the Vardar Ocean. This ocean basin developed during the Middle Triassic and was subsequently affected since Early Jurassic by an east-dipping intraoceanic subduction leading to the formation of SSZ magmatism. This subduction was thus responsible of the birth of fore- and back-arc oceanic basins separated by a volcanic arc during Middle to Late Jurassic. This event was followed by the obduction during which a section of oceanic lithosphere thrust westwards onto the Adria margin at the Jurassic-Cretaceous boundary, and the ocean was completely effaced. From this period to the Eocene the westward movement of the Ophiolites on the Adria continental margin, for more than 200 kilometres, till the Pindos took place

We also believe that the model of geodynamic evolution presented herein can be extended to the all Dinaric-Hellenic orogenic belt.

Two partial melting events as recorded by the U-Th-Pb chronometer in monazite: LA-ICPMS in situ dating in metapelites from the Bulgarian Central Rhodopes

Bosse V. [1], Cherneva Z. [2], Gautier P.[3] and Gerdjikov I.[2]

[1]*Université Blaise Pascal, Laboratoire Magmas et Volcans, UMR 6524 CNRS, 5 rue Kessler, 63000 Clermont Ferrand, France, V.Bosse@opgc.univ-bpclermont.fr*
[2]*Sofia University "St Kliment Ohridski", 15 Tzar Osvoboditel Blvd, 1504 Sofia, Bulgaria, cherneva@gea.uni-sofia.bg, janko@gea.uni-sofia.bg*
[3]*Université Rennes 1, Géosciences Rennes, UMR 6118 CNRS, Campus de Beaulieu, 35042 Rennes, France, pierre.gautier@univ-rennes1.fr*

In the Bulgarian Central Rhodopes, the lower part of the metamorphic pile is dominated by migmatitic orthogneisses having recorded fluid-assisted partial melting at 650-700ºC / 6-8 kbar. Several zircon and monazite U-Pb ages around 36-38 Ma have been reported, interpreted as dating the crystallization of melts. In the area of Chepelare, this pile is exposed as a ~5 km-thick north-dipping monocline. Structures document top-to-SW shearing developed during and subsequent to anatexis. In the middle part of the section, the ~1 km-thick Chepelare Shear Zone (CSZ) reflects late Eocene syn-metamorphic thrusting and exposes a variegated rock assemblage of highly sheared migmatitic gneisses hosting discontinuous layers of marbles, garnet-kyanite gneisses, metabasites, and ultramafics.

In order to constrain the P-T-time evolution of this variegated rock assemblage, we present new petrological and geochronological data obtained from garnet-kyanite gneisses. The samples represent melt-depleted residual granulite composed of zoned garnet and kyanite porphyroblasts of centimeter size in a low-portion matrix of K-feldspar, quartz and biotite. The latter forms retrograde rims around garnet, and together with kyanite, defines a rough foliation. In some samples fibrolite partially replaces synfolial biotite. The accessory mineral assemblage comprises monazite (up to 400 µm), apatite, zircon, rutile, ilmenite, staurolite, and graphite, found in the matrix, and as single or polyphase solid inclusions in garnet and kyanite porphyroblasts. Polyphase inclusions mark core-rim boundary in zoned kyanite and consist of K-feldspar, quartz, monazite, apatite, rutile, graphite, ± zircon, ± biotite. Planar faces of mineral grains suggest crystallisation of trapped melt. Graphite nucleation indicates participation of carbon-saturated fluids.

U-Th-Pb analyses on monazite were performed by means of LA–ICPMS in thin sections. The results yield two age groups related to the textural position of the monazite grain (included in a garnet or kyanite porphyroblast vs. in the matrix). Mesozoic ages, between 137 and 142 Ma, are most common. They were obtained in all monazite included in garnet as well as in polyphase inclusions in kyanite. P-T estimates based on the metamorphic record preserved in garnet and kyanite suggest granulite facies anhydrous melting, or low a_{H2O} fluid participation, at > 800ºC / > 1.2 GPa, that produced peritectic garnet (and probably