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EDITORIAL

New microscopies, biomaterials: Two new axes for *Morphologie*

Nouvelles microscopies, biomatériaux : deux axes nouveaux pour Morphologie

Morphology is nowadays the subject of an extraordinary development due to the appearance of new techniques, particularly in the microscopic field. Every year, new types of microscopy emerge and push down the old admitted dogmas: the Ernst Abbe's principle, which stated that the limit resolution of the optical microscope is physically fixed at 200 nm is now abandoned since the discovery of new laser applications (Eric Betzig, Stefan W. Hell and William E. Moerner, Nobel Prize in Chemistry 2014). In addition, the considerable improvements in computer science and

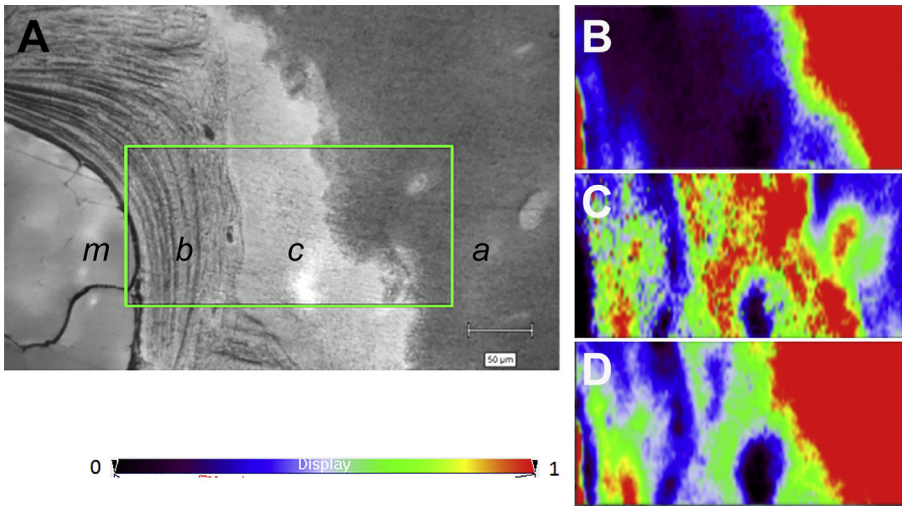

Figure 1 Raman imaging of articular cartilage and subchondral bone in a human femoral head, viewed on an epi-illuminated block. The different layers are easily identified with, from left to right, bone marrow (*m*), bone (*b*), calcified cartilage layer (*c*) uncalcified articular cartilage (*a*). The frame highlights the analytical area. A. Distribution of water, abundant in the marrow and uncalcified cartilage. B. Phosphate groups present in mineralized bone and in high amount in the calcified cartilage; C. —CH_2 groups of the collagen. The look-up table (LUT) is mentioned: the areas rich in the given molecules or species are in red, the areas containing less components are in blue-black.

Imagerie Raman du cartilage et de l'os sous-chondral dans une tête fémorale humaine, bloc vu en épi-éclairage. Les différentes couches sont aisément identifiables avec, de la gauche vers la droite, la moelle osseuse (m), l'os (b), la couche de cartilage calcifié (c), le cartilage articulaire non calcifié (a). Le cadre illustre la zone d'analyse : A : distribution de l'eau, présente majoritairement dans la moelle et le cartilage articulaire ; B : distribution des phosphates, localisés dans l'os et le cartilage calcifié ; C : cartographie des groupements —CH_2 du collagène. La table de correspondance (LUT) figure en-dessous. Les régions riches en molécules ou en groupement chimiques sont en rouge, celles pauvres en bleu-noir.

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the availability of more and more powerful machines has led to the application to microscopy of physical principles that were described many years ago but could not be applied practically until now. This is the case, for example, for Raman imaging based on a spectroscopic analysis of samples, which can produce molecular maps of a tissue (Fig. 1). Chandrashekhara Raman investigated some effects of the ''Molecular Diffraction of Light'' in 1928, which gained him the 1930 Nobel Prize in Physics. All these microscopic techniques are often reported as an acronym in the literature (e.g. ESEM [environmental scanning electron microscopy], FIB [focused ion beam], SIM [structured illumination microscopy], dSTORM [direct stochastical optical reconstruction microscopy], PALM [photo-activated localization microscopy], SAM [scanning acoustic microscope]... and *Morphologie* will welcome synthetic reviews on these emerging technologies and their applications in biology and medicine. These new methods are also becoming popular in a branch of medical science that has considerably developed since 2000': biomaterials. Biomaterials are specialized devices for repairing a given tissue or a function in the human body and they have gained a considerable interest. The number of papers, in the literature is growing exponentially. This is due to an increasing demand of biomaterials in all medical specialities to repair the human body: eye with synthetic lenses, teeth with dental implants, joints with prostheses, bones with ceramic substitutes, vessels, valves and even the heart in cardiology... With all these types of biomaterials, the prerequisite is to develop devices that are both compatible with the human fluids, resistant and biomimetic. The preclinical studies (preparation and animal studies) are great consumers of microscopic techniques to evaluate the interface between biomaterial and cells and also their cyto and biocompatibility responses. The clinical papers, in turn, are great consumers of medical imaging methods to analyze the placement and long-term evolution of biomaterials in the body. *Morphologie* will welcome such transverse papers on biomaterials combining anatomic and microscopic methods. Reviews on microscopic techniques and biomaterials will be presented in the next issues of our journal. We hope that these two directions will interest our readers as they often involve a large panel of morphological methods.

Disclosure of interest

The author has not supplied his declaration of competing interest.

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