COMBINED ANALYSIS AS A PLUS FOR FULL STRUCTURAL DETERMINATION IN TEXTURED MATERIALS: ORGANIC-IMPOSED DISTORTION IN BIOCRYSTALS FROM MOLLUSC SHELLS

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In the 1970's, A. Bobbio analysed Maya cranes exhibiting nacre teeth, and discovered their /ante-mortem/ character, tracking back the oldest signature of human implantology! The nacre implanted at that time came from mollusc shells. This let imagining the possibility of osteointegration of natural mollusc shells to replace human bone, not only in dentistry but in prosthetics in general. E. Lopez promoted this idea further in the 1980's, demonstrating that natural nacres of some bivalves are not only biocompatible but osteoinductive. These two fascinating discoveries gave rise to tremendous research developments at the interfaces of several scientific disciplines opening the following questionings: i) can we use the shells of other natural species for similar or ameliorated results? In particular, can we use shell spares from mollusc farming, somehow addressing an answer from mollusk phylogenists, palaeontologist, malacologists, biologists? ii) Can we detect, by any measurement method, which shell microstructures, structures ... would be the best appropriated to a given medical application, or can we detect already some differences between nacres from various molluscs, a question to physicists and radiation users? iii) is there a way to synthetically reproduce biogenic-like crystals of $CaCO_3$, hybridizing organic molecules (either synthetics or extracts from natural shells) with mineral calcium carbonates, involving biomineralisation and structural determination works ? iv) can we produce nacre-like bulks or cover prostheses with aragonite layers & implant them, a challenging task for material science, chirurgic & medicine ?

We will try to illustrate some of the actual achievements in these directions, focusing on texture result insights on these questions, & how the textural information brought by x-ray diffraction can be positively used in structural determination, taking the examples of structural distortions in mollusc shell layers of various species, how texture patterns reproduce mollusc phylogeny and offers character analysis to link ancestral species.