**New quantitative method for increasing information content in polarised light imaging of bone tissue.**

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In linearly polarised light (LPL), birefringent structures appear brightest if they lie both in the plane of the section and at 45°/135° to the axes of the crossed polarising filter elements, but dark if perpendicular to the section plane or parallel to either polarizer or analyser, preventing measurement of the whole scene at once because nothing can be resolved in the dark sectors of the 'Maltese cross'. This may be solved using circularly polarised light (CPL), when dip with respect to the section-plane may be quantified for plane parallel sections and we can use pseudocolour to produce dip maps. CPL, however, does not differentiate between in-plane orientations. We provide a new solution by combining numbers of PLM images to map orientations in 3D. We have automated the coupled rotations of polarising and analysing filters at, for example, 3°, 5°, 7.5°, 10° or 15° intervals through a range of 90° - with digital LPL images recorded at each orientation - and exploit digital processing. For in-plane orientation mapping display we use the colour circle sequence Red, Yellow, Green, Cyan, Blue, Magenta, where colour shows the orientation with 4 repeat cycles in 360º. Brightness is proportional to the cosine of the dip/strike angle with respect to section plane, being brightest in plane, and black when perpendicular to that plane, i.e., parallel to the optic axis. The dip value can be displayed in a pseudocoloured version of the sum of the separate monochrome LPL images using a Look-Up-Table with six 15° vertical orientation classes. The new method is powerful, label free and best used with unstained sections, but most stains do not interfere too much. Thus it may be used for much archival material. It proves to be excellent for undecalcified, uncalcified and decalcified tissue sections.

**Bone Research Society OnLine meeting. Poster abstract.** Muscle & Bone.

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