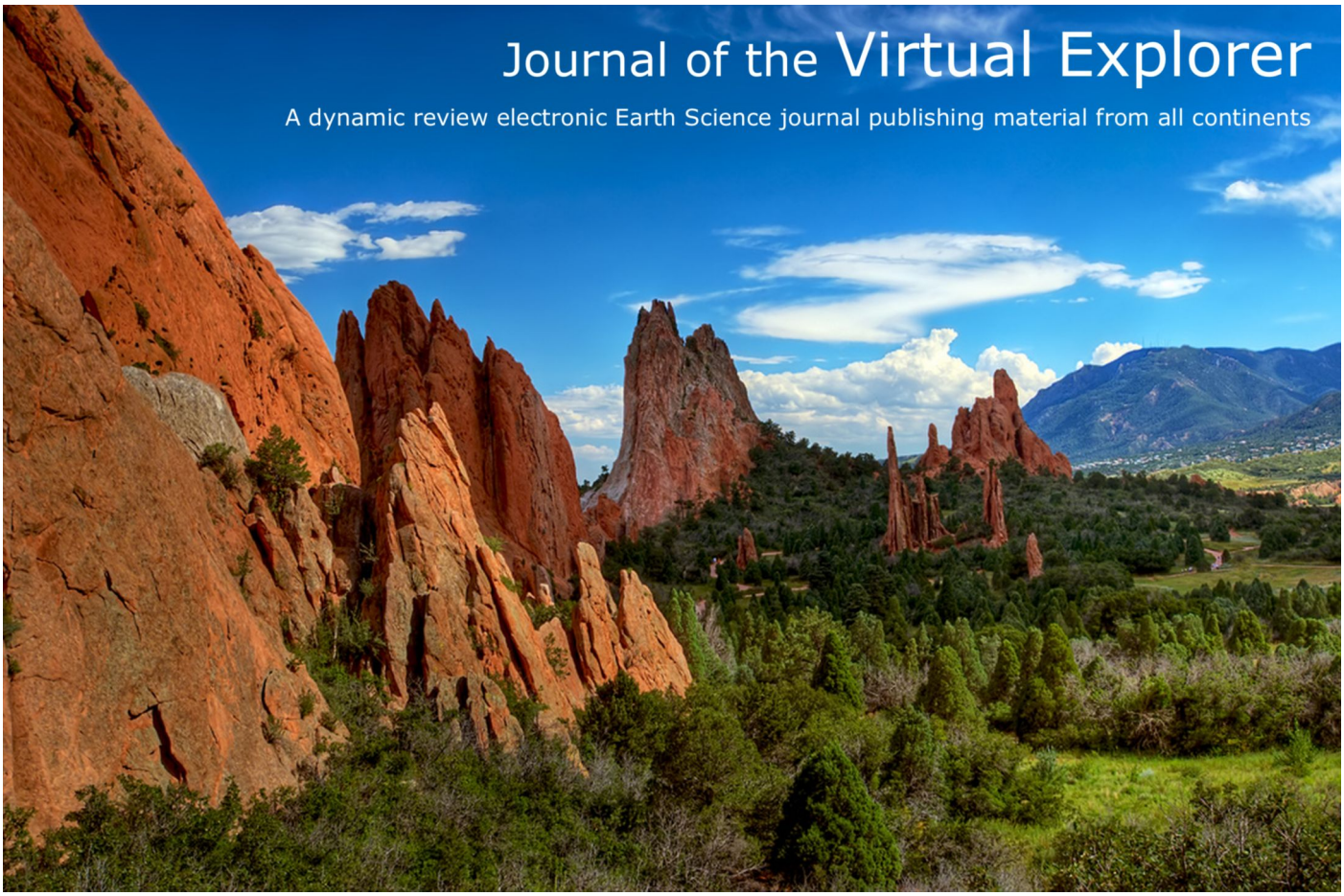

Optical orientation imaging

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Optical orientation imaging

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Abstract: The process of imaging refers to colour-coding physical information on a two-dimensional image plane. For example, if the physical information is the brightness variation on an illuminated object the image is a regular black and white photograph. If the physical information is the concentration of an element or the surface temperature the resulting image would be a chemical map or a thermograph. Many other examples could be given. Here we are interested in obtaining orientation images, i.e., maps of crystallographic directions, more specifically colour-coded maps of the optical axis orientations of uniaxial minerals (quartz, calcite, ice, norcamphor, etc.).

The first orientation images were produced by Bruno Sander and his collaborators in the early fourties. In order to perform what they called an "Achsen-Verteilungs-Analyse" (AVA), they placed a given microstructure in the optical microscope, drew a grain boundary map, measured the c-axis orientation of each of the grains with the Universal stage, and assigned colours to certain regions in the pole figure. Using this colour-code the grainboundary map was filled.

Nowadays we can produce such orientation images by means of digital image processing. Not only is this a much faster way of doing it, it is also a more precise and rigorous way. First of all, the orientation is determined at each point of the image and not only once per grain, secondly, we may also derive misorientation and deformation gradient images, thirdly we may select texture domains interactively which means that we can perform strain- shape- and grain size analysis as a function of crystallographic orientation.

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