PROJECT TITLE: How are coral skeletal growth rates affected by colony shape?

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Project description: Over hundreds of years, explorers, ship captains and scientists have visited coral reefs and collected specimens of entire coral colonies to send back to museums in Europe. A wealth of information is recorded in these coral skeletons about the life of the colony and the environment it once inhabited (Fig. 1). For example, the annual banding records how fast the colony was expanding, and the density of the skeleton tells us how much calcium carbonate the coral was laying down each year.

In this project you will use computer tomography scans of museum specimens to peel back the annual layers and reveal how individual colonies grew through time. The key questions we want you to answer are:

How do skeletal growth rates (extension, density and calcification rates)
• vary around whole colonies? (i.e. statistics of 3-D growth)
• vary with age?
• vary with morphology (i.e. the external shape of the colony)?

To do this you will learn and apply computer-based tools for volume quantification, annotation of bands and colony dating (e.g. AVIZO or Dragonfly to analyse micro-CT scans and GIMP for image annotation). These data will also be used to train an AI in a project in the Department of Computer Sciences. The museum specimens will need to be accurately weighed and this will take place during a visit behind the scenes at the Natural History Museum London.

Figure 1. A coral colony from the Natural History Museum collection scanned by micro-computed tomography (µCT). Reconstruction of the colony surface (left), skeletal density and annual growth banding (middle); and (right) the identification and quantification of endolithic communities and bioerosion rates (Image: R. Summerfield).

Work schedule:

6 weeks: desk work at university
1 week including trip to the Natural History Museum London to work with specimens.

Report and poster work: 3 x ½ day throughout the project to step back and assess results so as to start working towards report and poster – this will involve research group discussion. Then the whole final week to complete presentation and report.
Candidate requirements: The data is primarily computer-based and requires a willingness to annotate a large population of digital images with care and curiosity to explore the results. All training will be provided and you will be working along-side a PhD student (you can see Leo’s blogs on his work and some of the samples you will work on here https://www.4d-reef.eu/esr/leonardo-bertini/).

Travel and subsistence costs:
The placement will cover the cost of return travel and accommodation for the trip to the Natural History Museum in London.