WORKING ON THE DART PROJECT: HYPERSPECTRAL REMOTE SENSING AND ARCHAEOLOGY

July 29, 2011David StottArchaeological Prospection, Day of Archaeology, Day of Archaeology 2011, Science, SurveyAcademia, aerial photography, Archaeology, Bob Bewley,Cropmark, DART, David Stott, Environment Agency, Hyperspectral imaging, hyperspectral multispectral, Imaging, Materials science, Natural Environment Research Council, Nature, NERC,Physics, prospection, remote sensing, Roger Palmer, satellite imagery, Science, the Eagle, United Kingdom, University of Birmingham, University of Leeds

My name is David Stott and I am a PhD student at the University of Leeds. I'm working on the DART project, which is looking at improving our understanding of how archaeological deposits are detected using remote sensing techniques. This work is important, as remote sensing allows us to prospect for archaeological features and understand the nature of archaeological landscapes. This is crucial as better knowledge about the nature and location of significant cultural heritage sites enables us to protect them by mitigating human actions and environmental processes that place them at risk.
My role in this project is to look at contrast in optical remote sensing data, specifically multi and hyperspectral aerial and satellite imagery. Archaeological features are identified in these data because past anthropogenic activity creates differences in soil which can be detected because they contrast with the surroundings. These differences are either observed directly, for example as as changes in bare soil on the surface, or by proxy, where the underlying soil causes differences in the ground cover, for example as cropmarks. Cropmarks are variations in vegetetation stress and vigour caused by underlying differences in the soil, and are the means by which most buried archaeological sites are identified in the UK. What makes them interesting is that cropmarks are visible only when variables such as climatic conditions, crop type and soil types intersect. Getting a better understanding of how these factors influence the formation of cropmarks will allow us to acquire our data at the optimal time, leading to better value from these data. Looking at contrasts outside the visible spectrum is vitally important for this work as there may be subtle contrasts that are not detectable using conventional aerial photographic techniques.

To do this I'm doing repeated surveys over the same archaeological feature using a spectroradiometer, which measures reflectance across the electromagnetic spectrum from the near ultraviolet to the shortwave infrared. This allows us to simulate what we

would see from an aerial sensor but at much greater spatial and temporal resolution. In addition to this I'm also measuring crop height, density and chlorphyll content. My colleagues from the University of Birmingham have installed TDR sensors in the features that will allow us to accurately determine soil moisture and temperature at the time these surveys are conducted. To extend these ground-based observations to more features, crops and soils we have acquired imagery from a variety of sources. We've got hyperspectral data from the Environment Agency and NERC. Roger Palmer and Bob Bewley have been taking oblique aerial photographs and we're in the process of applying for grants
to get additional hyperspectral flights next year and as much multi-temporal stellite imagery as we can.

Now that I've explained what I'm doing I'll talk about what I'm doing today. I spent my morning trying to process some of the Eagle hyperspectral imagery provided to us by the ARSF at NERC. This imagery has 255 bands. I'm away at my parents house in Argyll, so I'm working on my laptop. This is not ideal as the data is 114GB in size so I've had to delete anything superfluous that was lurking on my hardrive. Goodbye music, films and a big chunk of photos. Once I start processing the data it will take about 12 hours to run it's course during which time I can't do much else on my computer, so I'll sit in the sun and catch up on my reading and maybe later go and look some lumps and bumps in a field.

Thanks for reading. Please follow the progress of the project on the DART project website, on twitter as @DART_Project and on Flickr here and here