JSPS – Website Report
Dr Adam T. Clare – University of Nottingham

For the period of December 10th 2010 to January 14th 2011 I was fortunate enough to be awarded a short term fellowship to begin collaboration with Prof Masanori Kunieda of The University of Tokyo.
Prof Kunieda was very generous in agreeing to act as my host but also helped in facilitating other aspects of my visit including arranging my accommodation and also introducing me to colleagues working in similar research areas in Japan. These included Prof Okado and Prof Uno at The University of Okayama whom I visited during my stay in Japan.
Working with Prof Kunieda and his students we were investigating the differential machining characteristics that have been reported when electrical discharge machining (EDM) is undertaken on single crystal silicon of various dopant types and orientations. EDM is a non-traditional machining method which relies upon the repetitive electrical discharge (sparking) which occurs between an electrode and the workpiece. Developments with respect to precision stages and enhancements in volumetric removal per spark make EDM an attractive technique to introduce machined features to silicon wafers.

A series of experiments were undertaken in which micro holes (150um) were EDM drilled in low resistivity silicon wafers of two orientations (100,110) and two dopant types (n and p-type). Tool advance rate, surface roughness, electrode wear and resulting hole size were investigated. Characterisation of the machined surfaces was partly undertaken during my time at The University of Tokyo with the intention of continuing this work upon my return at the University of Nottingham.
Initial trials revealed significant variation in the stability of the tool advance rate. This was attributed to poor contact between the silicon work piece and the earthed machine table. Should this contact vary then the electrical potential drop between workpiece and electrode may also vary and thus none uniform energy discharges will be observed. This problem was overcome by utilising a tool maker's vice to increase the contact area with the workpiece and so reduce the contact resistance. This research is currently on going and will be continued by student's under the direction of Prof Kunieda. It is also my intention to conduct similar trials with EDM facilities at the University Of Nottingham. We would hope with continued collaboration to produce a publication which details our work.


Clock Tower (University of Tokyo)