

### **ATAS EXAMPLE RESEARCH PROPOSALS**

**Good examples** – *all of these would be acceptable and are designed to show you the level of detail we would be keen to see. We should emphasise that we are able to assess complex technical details – there is no need to dumb these proposals down.*

1. Composite tubes are used in many engineering applications including pneumatics, robotics, aeronautics and manufacturing engineering. This research aims to investigate the failure characteristics of glass-epoxy composite tubes subjected to compression loading under changing thermal gradients. Experimental tests will be conducted to better understand how biaxial compressive strength varies with temperature and material characteristics. Testing will include strain measurements, indentation testing and crack analysis. Results from experimental measurements will be used to develop an improved analytical model for the mechanical performance of composite tubes.
2. Sonic booms from supersonic aircraft create numerous difficulties, including environmental disruption and aero-elastic stressing of an aircraft superstructure. This research will explore the use of automatic differentiation using the reverse mode, together with adjoint-based optimal design, as a means to minimise the sonic boom around an aircraft. The project will involve mathematical analysis and computer programming using the NAG library, together with experimental verification using a Mach 3 capable supersonic wind tunnel. Experimental instrumentation will include Laser Doppler Anemometry for flow field measurement and Schlieren photography for shock wave visualisation.
3. This research project will investigate the regulation of expression and function of the inducible L-arginine-nitric oxide pathway in cultured vascular cells. The aim is to define the signalling mechanism(s) that regulate the induction of both nitric oxide synthase and the cationic amino acid transport proteins associated with uptake of L-arginine into cells. The project will involve cells in culture and basic molecular techniques including qPCR analysis, protein biochemistry, western blotting, qPCR analysis, mRNA isolation quantification and analysis.
4. Satellite imagery offers a number of potential benefits for the analysis of environmental phenomena. This project proposes to use SPOT2 multi-spectral data to analyse sediment concentrations in the Mississippi River delta. Reflectance measurements will be calibrated against in-situ field measurements of sediment load. These sediment data will then be integrated into a three dimensional hydrodynamic model of the Mississippi River delta with the aim of developing improved sediment transport models for complex stratified estuarine flows.

### **Bad examples**

1. The student will work in the area of material science on a PhD programme. They will carry out experimental tests, analysis and report writing. Testing will include strain measurements, indentation testing and crack analysis.

***Reason for being poor: insufficient information on the scope and application / use of the research. Little context provided and terms such as material science are too broad. It would be helpful to give a little more detail on which experimental tests and what methods / techniques they might be exposed to. However it is useful to know the sorts of measurements and testing they might undertake.***

2. This project will involve the mathematical analysis of sonic booms from aircraft. The work will involve automatic differentiation. It is possible that some verification with experimental measurements will be conducted. The project will involve mathematical analysis and computer programming using the NAG library.

***Reason for being poor: again, insufficient information on the application / use of the research. The summary does provide some useful methods and techniques, such as automatic differentiation, computer programming, the NAG library and experimental measurements, but it would be helpful to know a little more about the type testing that might be carried out and whether this was being applied to civilian aircraft at relatively low speeds or military aircraft at considerably higher speeds.***

3. Satellite imagery offers a number of potential benefits for the analysis of environmental phenomena. The applications of this are as diverse as disaster management, analysis of agricultural products, flooding and sediment deposition in river basins and remote mapping. This project proposes to use SPOT2 multi-spectral data to analyse sediment concentrations in the Mississippi River delta. Satellite images will be acquired from a number of international sources and scanned into a computer using a high-resolution scanner. After image processing reflectance information at specific frequencies will be extracted. Field measurements of sediment load will be carried out using eight boats during March and April when the sediment load is at its lightest in the delta. Samples will be taken simultaneously on a 10m grid, across the delta, then stored in sealed tubes and returned to the University for analysis. At the same time as physical sampling, measurements will be made with acoustic and laser devices to determine in-situ suspended sediment load at depths of 0.2m, 0.5m, 1m, 1.5m and 2m from the surface. The satellite reflectance measurements will be calibrated against the in-situ field measurements of sediment load. These sediment data will then be integrated into a three dimensional hydrodynamic model of the Mississippi River delta with the aim of developing improved sediment transport models for complex stratified estuarine flows.

***Reason for being poor: A little too much information. It provides the application / use of the research, some information on the type of satellite and measurements being made, which is helpful. However too much information is provided on how the research will be carried out and when. It may be useful to know the type of satellite data, that field sediment measurements are being taken and compared against reflectance, but information on 10m grids, scanning data, depth measurements, etc, may be unnecessary.***