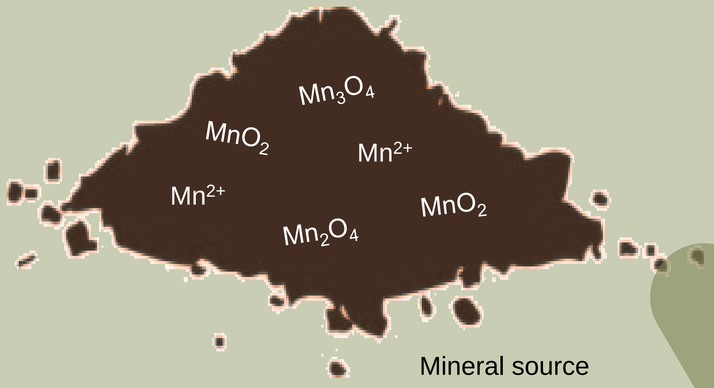
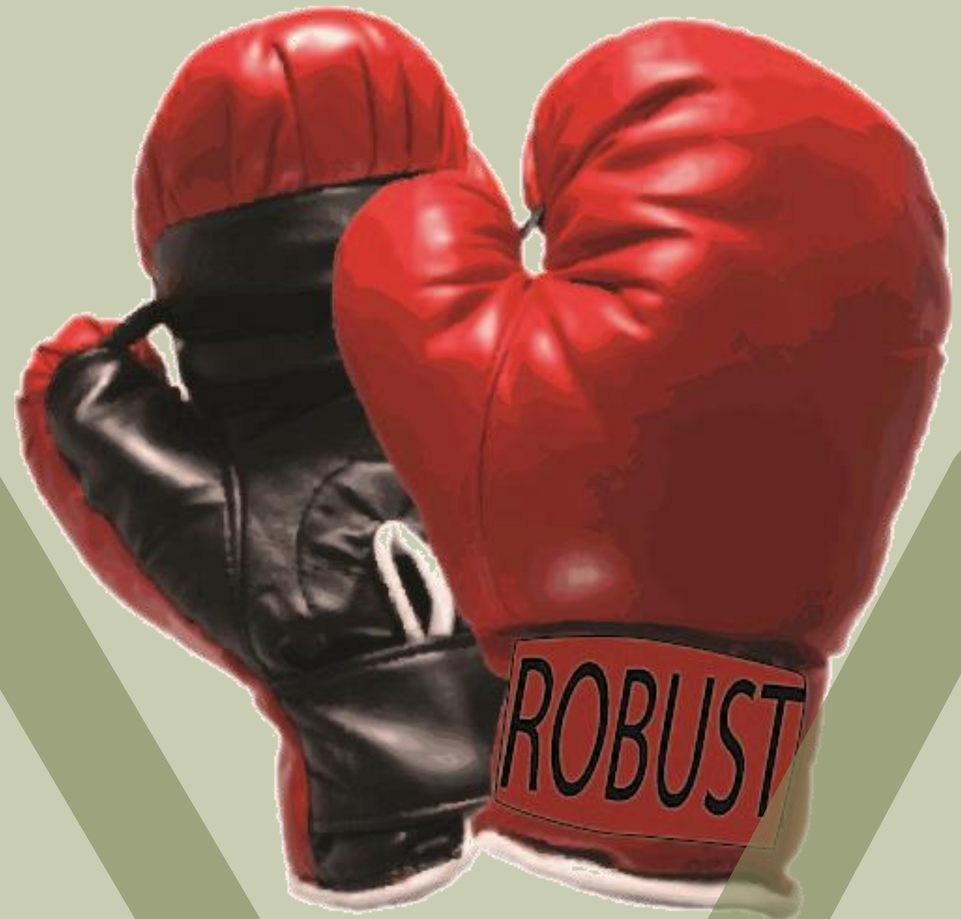
FIGHTING DIRTY

By Nina Finlay
School of Engineering and Computing Sciences
2010

WASTE



Mineral source



WASTE

Contaminant

A team of students and staff at Durham University are working on a project called ROBUST, which stands for: ***Regeneration of Brownfield Using Sustainable Technologies****.*

BACKGROUND

Brownfield land *is land which has been built on, or had industry on it in the past. This means that there may be spots of contamination like oil and diesel left in the ground, and these must be cleaned up before we can use the land safely again.*

In the UK, we need to ***re-use*** *brownfield land to make the best use of space and prevent our green countryside from being built on. However, cleaning up contaminated land can be very difficult and expensive.*

ROBUST is particularly interested in commercially low-value brownfield land, which is of less interest to developers and where expensive clean-up treatments are not practical.

'GOOD' WASTE

Within the ROBUST project, we are exploring the possibility of using ***'waste' materials*** *to clean up contaminated land. One promising example is a natural mineral called* ***manganese oxide****, which is found as a by-product from international mining industries and from use in the UK water treatment industry. These minerals have the potential to transform harmful chemicals into harmless ones!*

ENVIRONMENTAL GEO-CHEMISTRY AND SOIL SCIENCE INVESTIGATIONS

I am exploring ***if*** *and* ***how*** *these sources of waste minerals help to breakdown contaminants that might be found in the ground, such as oils and toxic compounds. This involves looking into the* ***chemical reactions*** *that happen between the mineral and the contaminant within the complex soil system.*

BASIC STEPS IN A PRELIMINARY EXPERIMENT

- *Add a known amount of manganese oxide and a known amount of contaminant to some clean soil. Keep all other variables constant e.g. temperature, light, contact time.*
- *Use analytical techniques and instruments to extract the remaining contaminant from the reaction, measure how much of the contaminant is left and compare it to how much we started with.*
- *Run control trials consisting of the soil and contaminant with no mineral phase. We can then get an idea of how well the mineral is working to transform the contaminant.*
- *Scale up experiments from test-tube size to large-scale field trials.*

QUESTIONS TO BE ADDRESSED

- ***How effective is the waste source of manganese oxide at breaking down contaminants?***
- ***How do environmental factors influence this relationship?*** *For example the weather, i.e. sunlight, rain and temperature.*
- ***How much manganese oxide is required and is this realistic?***
- ***What is the best method of applying the mineral?*** *The application must be effective but also practical, controllable and safe. One idea is to simply dig in the 'good' waste with a bucket and spade.*
- ***What happens to the mineral once it has done its job in the soil?***
- ***What effect does the addition of extra manganese oxide have on the 'health' of the soil?***

THE BENEFIT

Using waste materials to clean up contaminants could provide a cheaper, more environmentally friendly and sustainable alternative to current practices like landfill.