The effects of chronic low dose radiation on plants

Nicol Caplin

University of the West of England

What's the situation?

- What do we already know ?- effects
- Where is the knowledge gap?
- Why do we need to fill this? - Inform and enhance studies
- Why are plants interesting? - useful tools for understanding impacts from environmental pollutants on ecosystem health … and also potential agricultural impacts.
- Biomarkers can remove some uncertainty surrounding risk

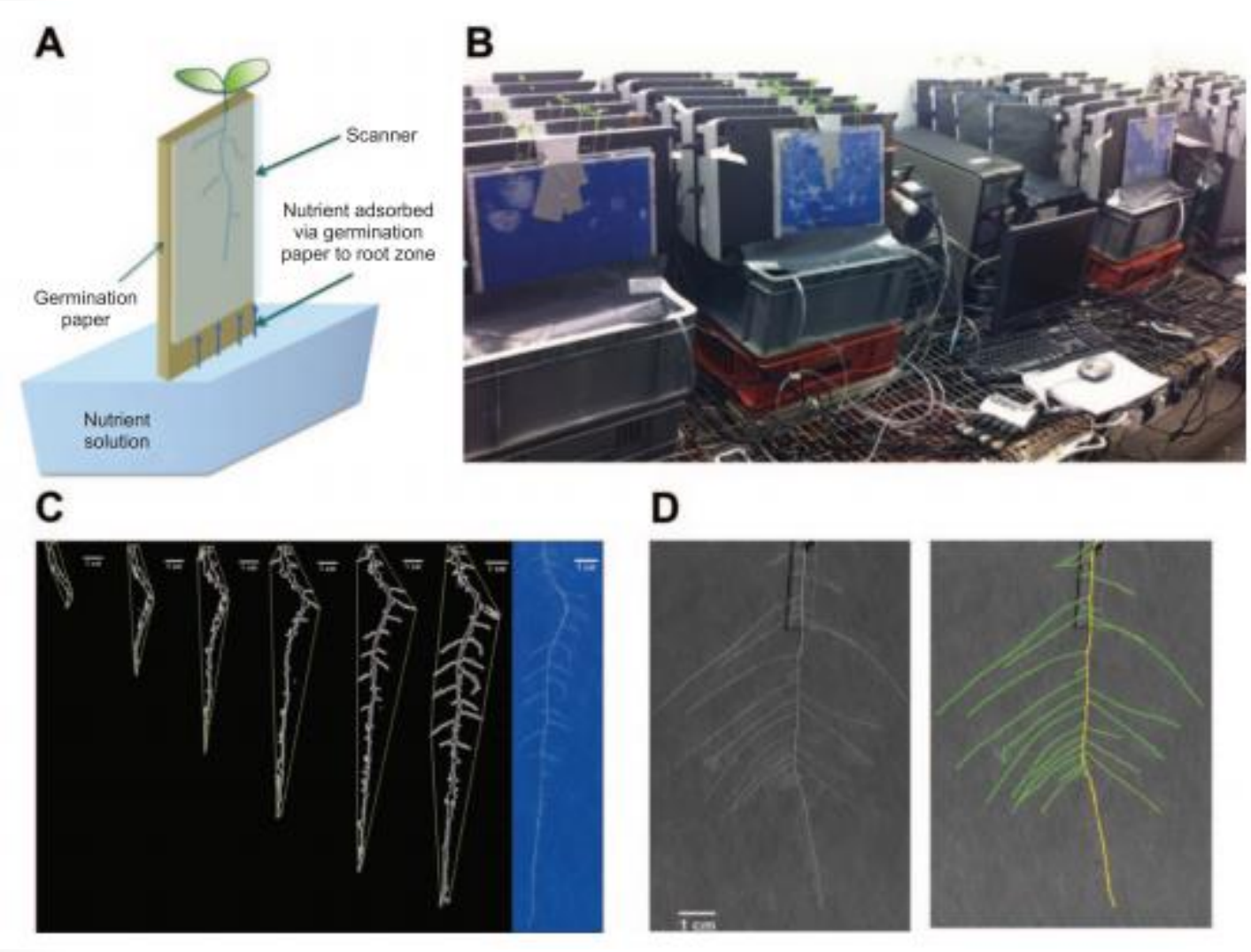
Challenges

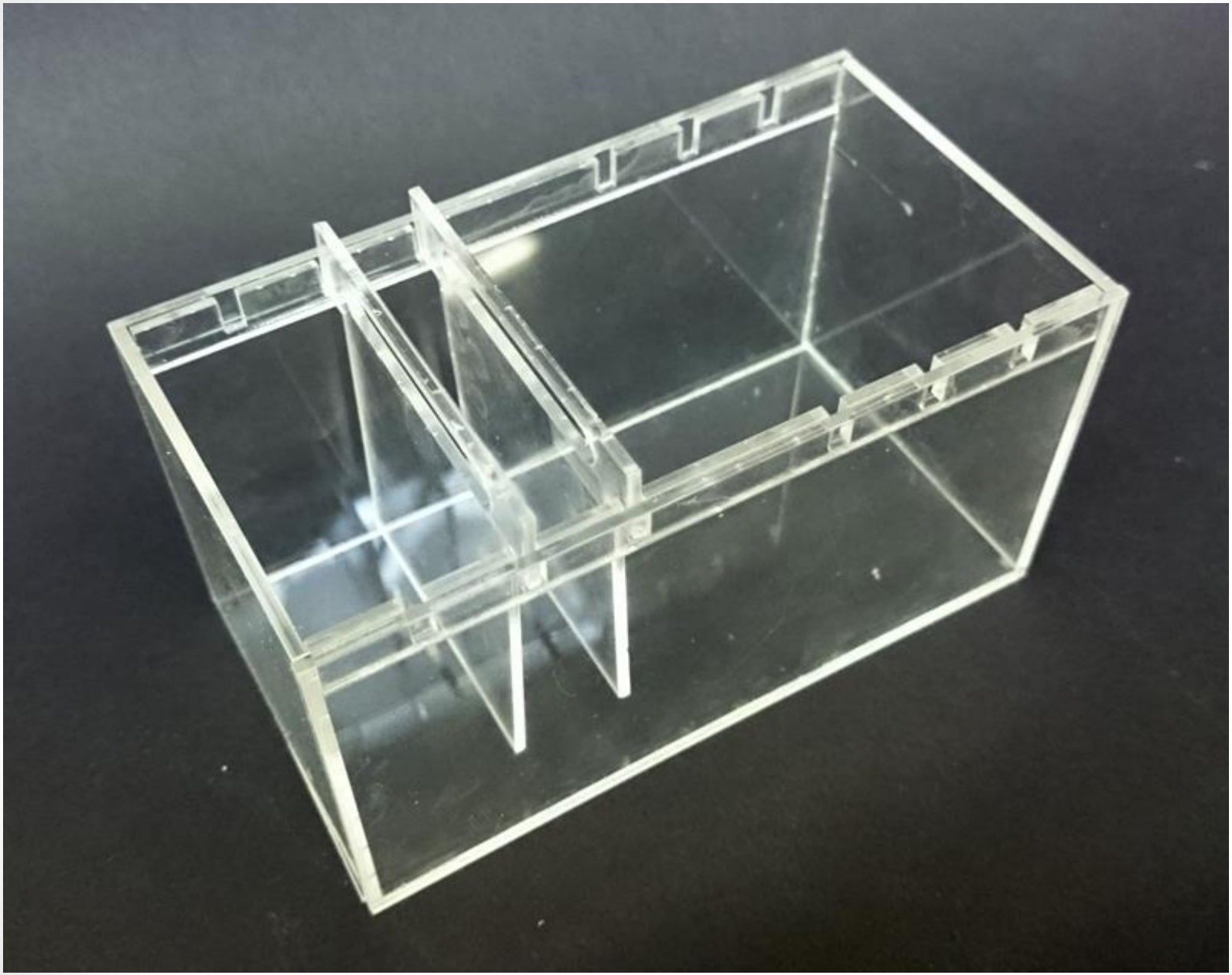
Roots are difficult to study

Typical root studies involve extraction from a growth medium and washing prior to analysis but important data may be lost in this way (i.e. fine roots/root hairs can be damaged/destroyed)

How can we overcome this?

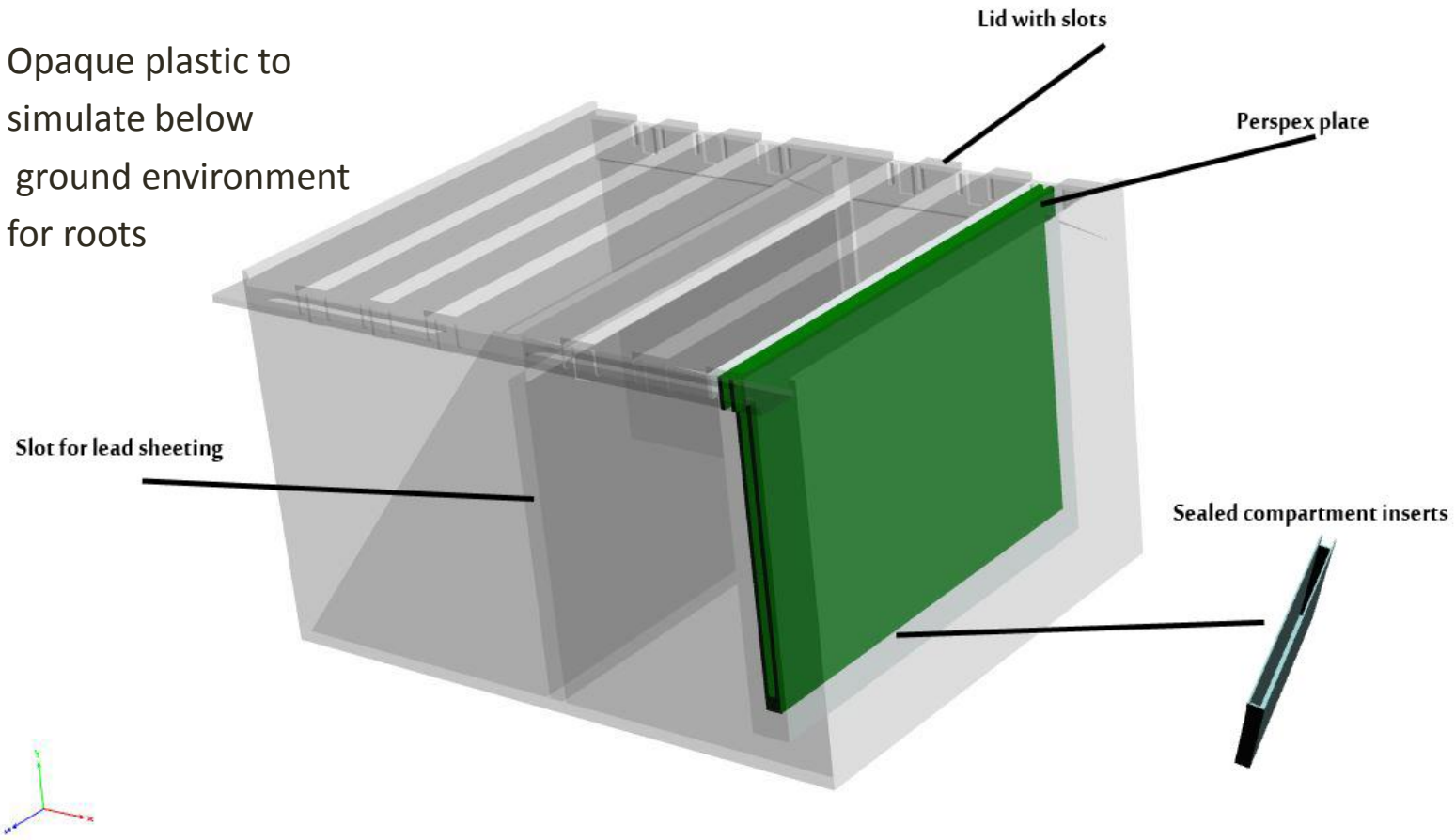
- Plants can be grown in a hydroponic setup between sheets of Perspex or similar transparent material
- The roots can be scanned completely undisturbed
- Interesting to develop a similar method for this study area


A
Scanner
Nutrient adsorbed via germination paper to root zone
Germination paper
Nutrient solution
B
C
D
1 cm



Protocol development

Opaque plastic to simulate below ground environment for roots



Experiments

Protocol development

Specially adapted plant growth container for:

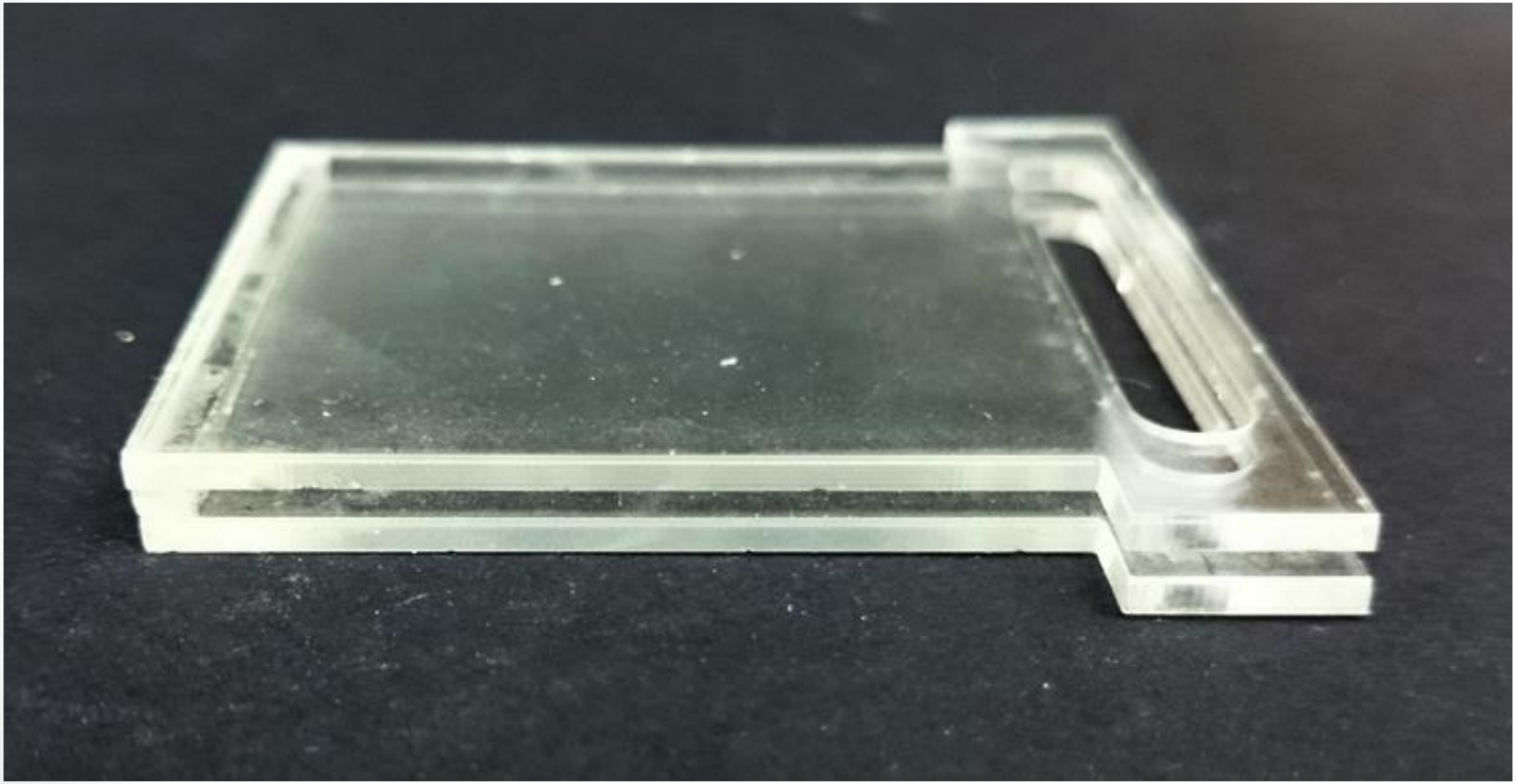
- environmentally realistic doses (<100 µGy/h)
- Internal vs external
- γ and β (Cs-137, Tc-99)

Morphological effects:

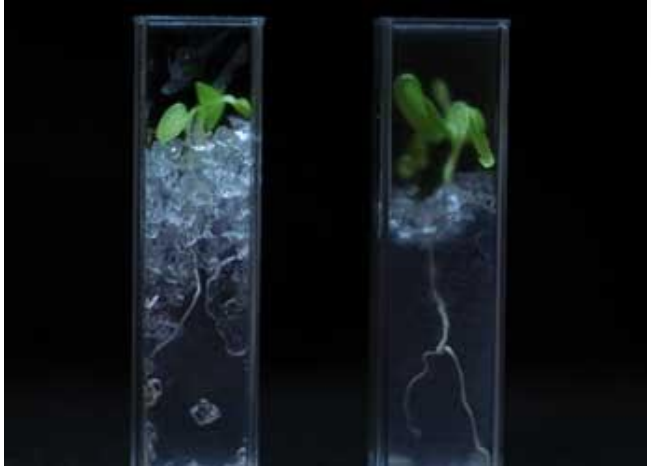
- Totally undisturbed root system, can be analysed completely in tact via scanners

Physiological effects:

- We will carry out additional studies … genetic effects, bioassays, oxidative stress response…



Future plans



- If this new protocol is successful it can enhance our understanding about how plants are affected by radiation

- Transparent “soils” are currently being developed that share similar properties of real soil and could make for interesting comparison studies once these have been proven (Downie et al., 2012).

Our method has much scope for development and offers flexible experimental design (Able to be made for as many or as few replicates as needed in any combination).

Thank You