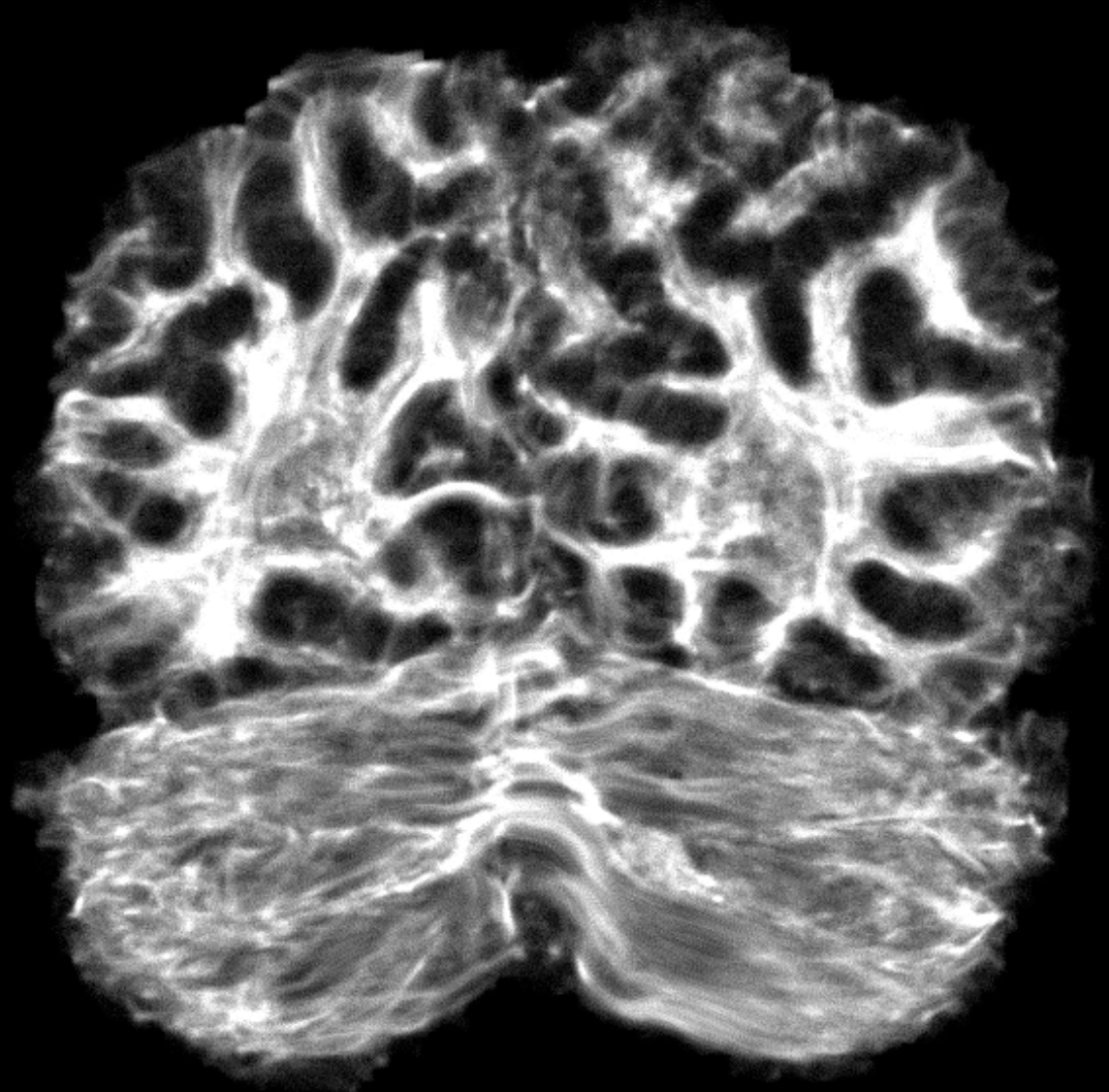
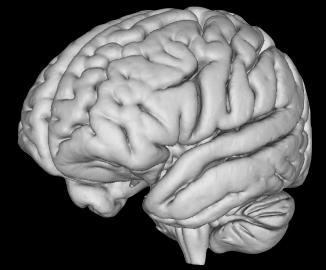


# UK Biobank - Human Connectome Project - developing HCP

Steve Smith - *FMRIB, Oxford*





environment & lifestyle



long-term health outcomes



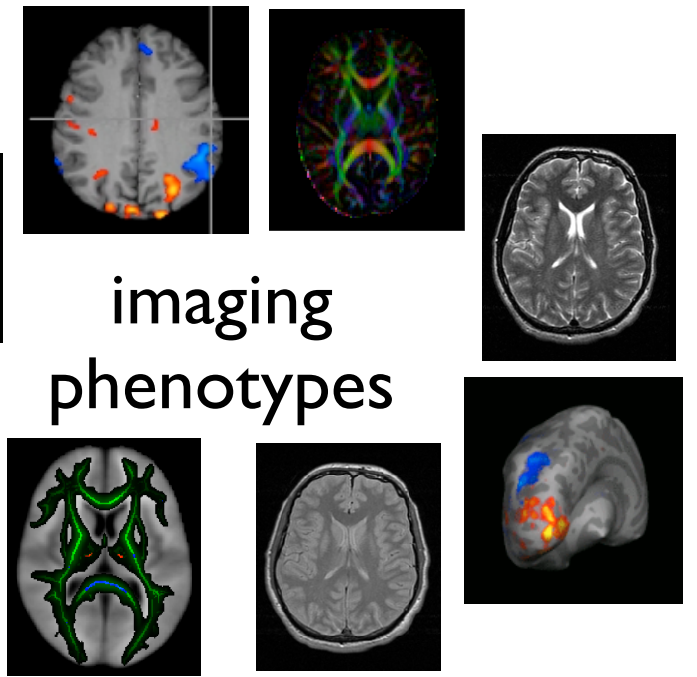
learn



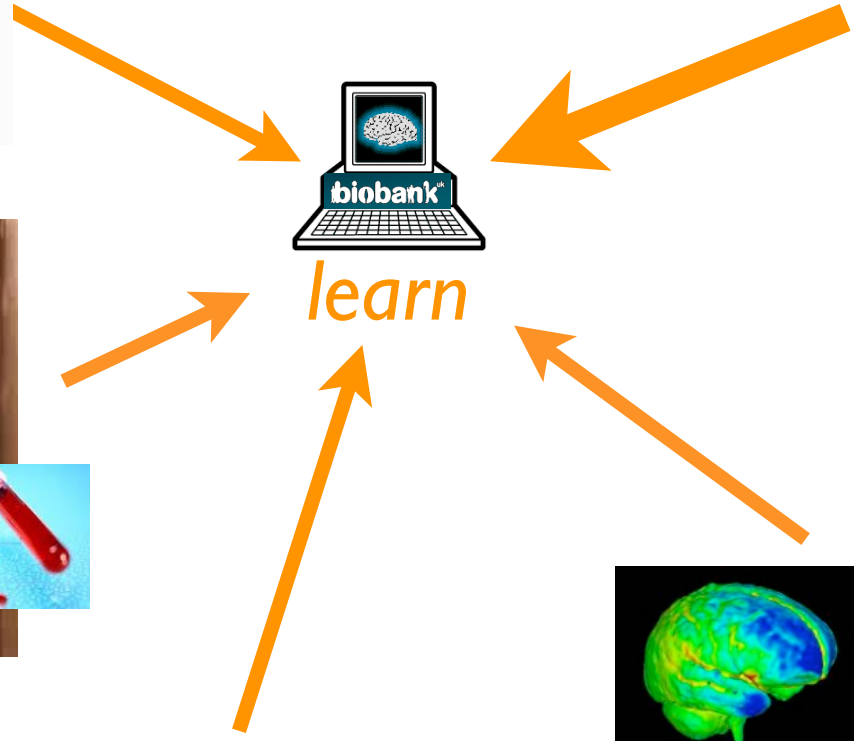
blood chemistry



genetics



imaging phenotypes





environment  
& lifestyle



long-term health  
outcomes



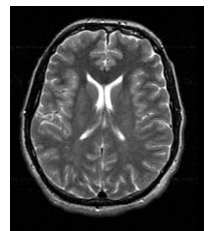
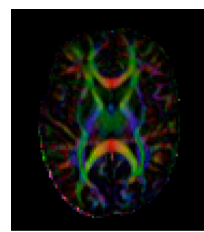
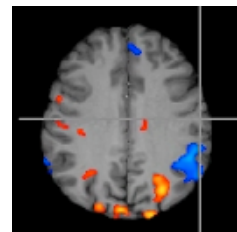
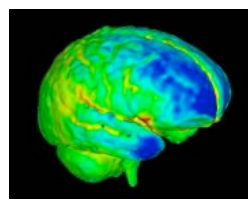
predict



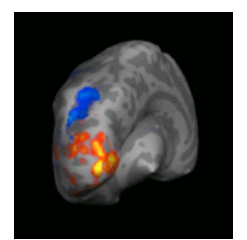
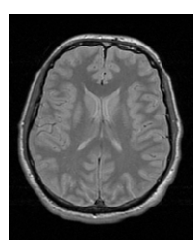
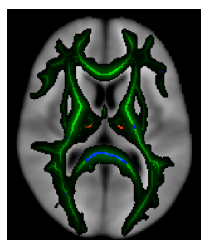
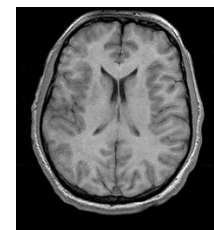
blood chemistry



genetics



imaging  
phenotypes

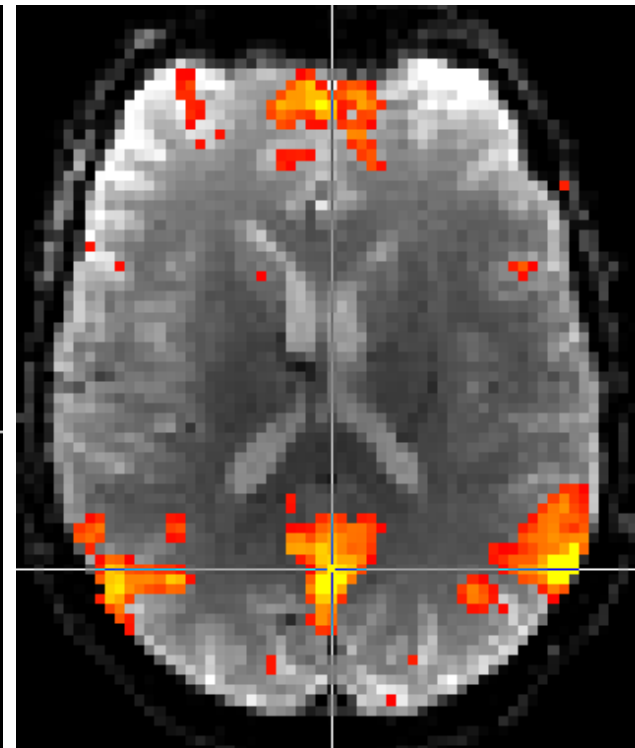
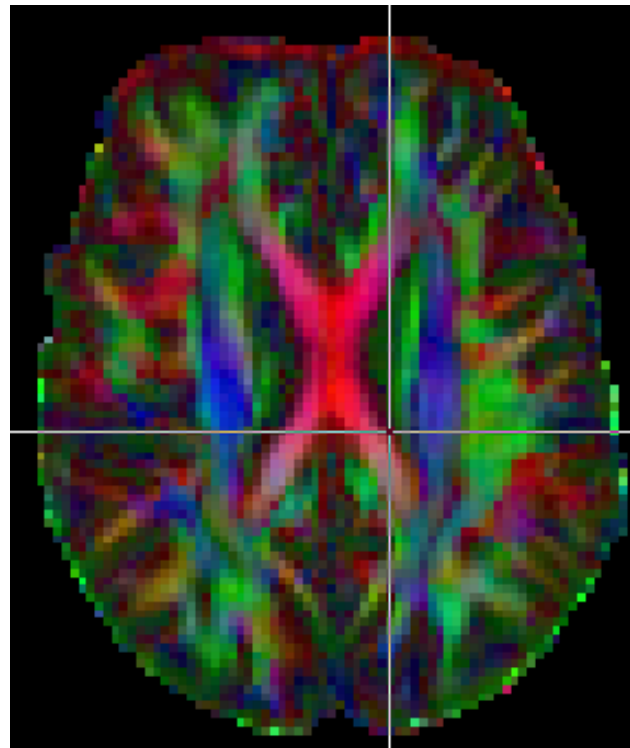
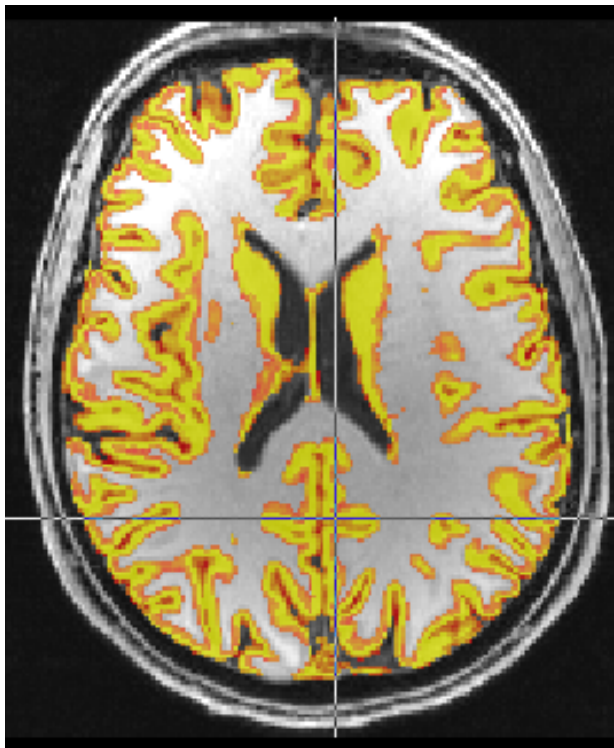


# UK Biobank Imaging [tinyurl.com/odvfn4e](https://tinyurl.com/odvfn4e)



- Original prospective epidemiological study: 500,000, 45-70y
- Imaging Extension: now bring back **100,000** for MRI
  - Discover multi-modal early imaging markers of disease
  - Largest neuroimaging study ever, by a factor of 10

*PI: Rory Collins, Imaging Working Group Chair: Paul Matthews, Brain Imaging Leads: Steve Smith & Karla Miller*

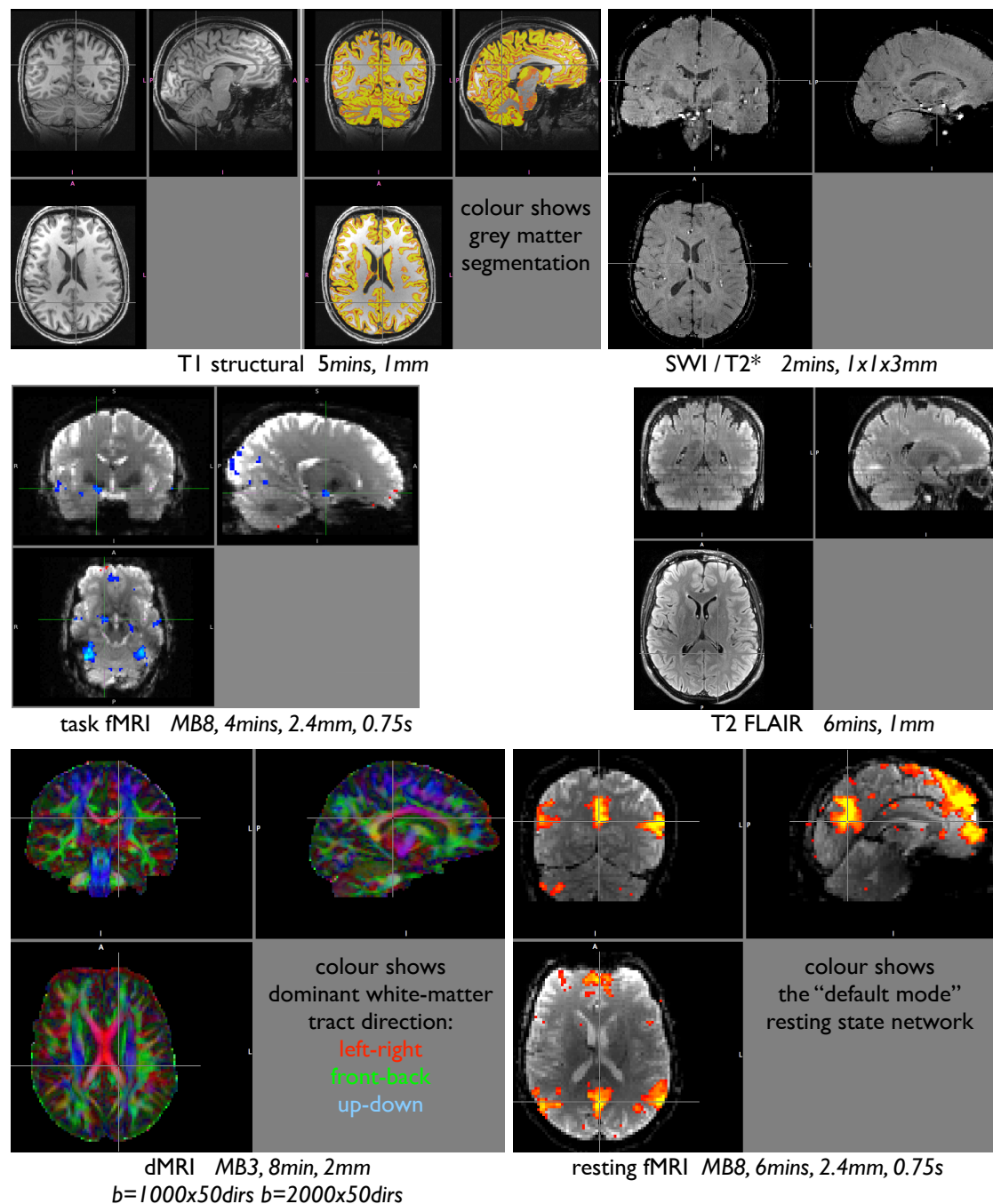


# UK Biobank Imaging

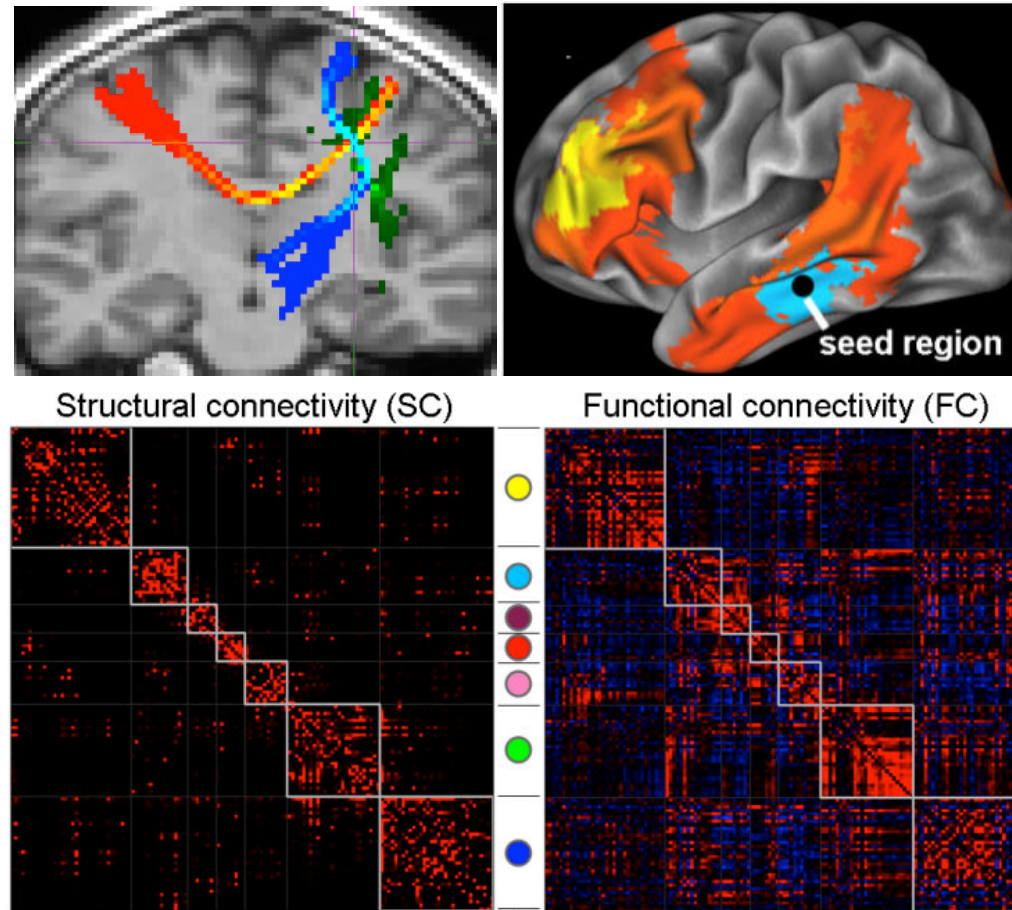
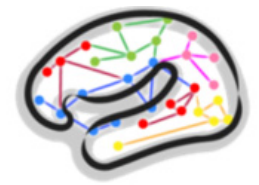
[tinyurl.com/odvfn4e](http://tinyurl.com/odvfn4e)



- **Neuroimaging**  
*6 structural / functional modalities in 35min*
- Cardiac MRI
- Whole-body-fat MRI
- DEXA bone density
- Carotid Ultrasound
- ***x 100,000 subjects***
- ***3 identical scanning sites***
- Automatically generate hundreds of imaging-phenotype measures for use by non-experts



# NIH Human Connectome Project (HCP)



- \$40m NIH: *best possible in vivo human macro-connectome mapping*
- **WashU - UMinn - Oxford** *Van Essen / Ugurbil* (+MGH)
- 1200 subjects: **dMRI, rfMRI**, tfMRI, MEG, behaviour, genetics
- **Now also extended to wide age range (4-75y)**

# the *Developing* HCP



*In utero dynamic MRI: Edwards & Hajnal*

- Extend brain connectivity mapping to understand brain **development**...
- ... imaging 1500 babies before and after birth
- ... and modelling the effects of genes and environment
- including 200-400 babies at risk of autism, and 200 born prematurely
- Kings - Imperial - Oxford

# cross-fertilisation

- new technology developed mostly under HCP and valuable for Biobank, dHCP, etc. - e.g.
  - multiband EPI acceleration (fMRI & dMRI)
  - robust eddy correction for monopolar dMRI (much faster & better CNR)
  - ICA+FIX fMRI artefact removal
  - Surface+volume grey-matter representations
- dataset complementarities of data quality/quantity vs subject numbers