New prospects for imaging the developing brain: opportunities and challenges

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The brain undergoes rapid development during the fetal and neonatal period with lifelong consequences, presenting a critical window for investigations using structural and functional imaging. A number of high-profile projects are currently underway to acquire high quality data in the perinatal age range and make them available to the community. These include the developing Human Connectome Project and the Washington Fetal Brain MRI Database, amongst others.

These resources are expected to lead to high impact discoveries. However, data acquisition and analysis is challenging in the developing brain, and users should be aware of the constraints as well as the possible benefits and opportunities inherent in the data. Many, if not all, imaging characteristics change dramatically during development, including brain size, image contrast and artefacts, physiological signals and behavioural features such as head motion. This symposium will review the technical challenges that arise from imaging these complex changes, identify leading strategies, and describe approaches to address key unresolved challenges.

This programme will cover a range of aspects, including the biological differences in the developing brain compared to the adult brain, their impact on the acquired data, the practical issues of scanning small subjects prone to motion, and the adaptations needed in both the imaging protocol and the associated post-processing and analysis techniques to handle these issues. State of the art methods will be presented, and outstanding problems and questions that remain to be satisfactorily answered will be discussed.

The practical challenges of perinatal imaging
Manon Benders, University Medical Centre Utrecht, Utrecht, Netherlands

Imaging the perinatal brain – developments in acquisition and reconstruction
Joseph Hajnal, Centre for the Developing Brain, King's College London, London, United Kingdom

Acquisition and reconstruction in fetal imaging: Building the University of Washington Fetal Brain MRI Database
Colin Studholme, Biomedical Image Computing Group, Department of Pediatrics, University of Washington, Seattle, WA, United States

Unanswered questions in perinatal imaging: looking to the future

Petra Huppi, University Hospital, University of Geneva, Geneva, Switzerland