

# The LASAR Epistemic Insight Project Symposium

Contact Prof Berry Billingsley, Email: [berry.billingsley@canterbury.ac.uk](mailto:berry.billingsley@canterbury.ac.uk)

27<sup>th</sup> October 2016, Somerville College, Oxford

Contact: Berry Billingsley [berry.billingsley@canterbury.ac.uk](mailto:berry.billingsley@canterbury.ac.uk)

## Introduction

We're delighted that you will be attending this event. One aim for the meeting is to stimulate and exchange ideas. The second is to advance a number of potential international research projects and bring on board collaborators. All the projects are concerned in some way with science, religion and education and we move from one to another in the three sessions during the day. The schedule for the day is:

**11:00-12:30** Primary Plus Project

**12:30-13:30** Lunch

**13:30-15:00** World of Physics Project

**15:00-15:10** Break

**15:10-17:30** Character and Personhood Projects (robots, soul and artificial moral agency)

These will be developed / refined / rebuilt during the day. Via the symposium and /or following it, please tell us if you would like to collaborate with us on one or more of the projects.

## Broad themes across the symposium

There already exists a body of research which raises concerns about the consequences of teaching science via a focus only on core concepts and so-called 'recipe' investigations.

Misconstrued perceptions of the nature of science can affect students' attitudes towards science and they can also affect their beliefs beyond the science classroom. With this in mind our team (of researchers in Christ Church Canterbury University and the University of Reading) have been exploring students' attitudes to studying science at primary, secondary and tertiary level and their insight into the nature of science. Data from this research confirms that students frequently perceive science as a set of limitless and proven facts (Billingsley et al. 2016). Secondly the findings indicate that within the group of students who like science, a significant proportion (particularly of girls) are non-scientific, which is to say that they tend not to see science as a way to fully explain reality and they enjoy deliberating on the place of science in the context of bigger multidisciplinary questions. These findings resonate with other research which shows that boys appear to be more interested in the internal coherence of physics (and technology) whereas girls tend to be interested in the wider



coherence of ideas and are reluctant to say they understand a concept until they can put it into a broader (non-scientific) context (Stadler et al., 2000).

The implications of this research are twofold:

- Firstly school science courses need to do more to develop children's appreciation of the relevance, power and limitations of science in multidisciplinary contexts.
- Secondly it may follow that students who are non-scientific would be more strongly drawn to STEM subjects if they were given opportunities to think critically about the nature of science in multidisciplinary contexts.



# Stimulus for Primary Plus Project with children aged 5-13

## Exploring strategies to raise children's insight into how science, religion and other disciplines relate

*Researchers: Dr Manzoor Abedin and Arthur Galamba*

### Some Relevant findings

- A survey by the LASAR (Learning about Science and Religion) project shows that by age 10 children already characterise science and religion in ways that lead to conflict, while a third (34%) agreed that "Science and religion disagree on so many things that they cannot both be true" (n=771) (Billingsley and Abedin 2016, forthcoming).
- Comments by primary students on what is science:

*"Science is knowledge based on facts – learnt by experiments and observations"*

*"Science is so advanced nowadays that there is an explanation for most things"*

*"I only believe science and logical answers and theories"*

For these reasons this project will for the first time investigate the value of teaching children in primary and secondary schools about the questions, methods and norms of thought in science alongside other disciplines as a way to extend children's appreciation of the relevance, power and limitations of science.

### Research Questions

- What are students' perceptions of the relevance, power and limitations of science particularly in relation to other disciplines?
- What are the underpinning ideas about science that may limit students' capacities to progress to greater epistemic insight? For example:
  - What is school students' understanding of the notion of 'evidence'? Are they in a position to discuss issues around evidence in scientific and non-scientific disciplines? Do they equate evidence with proof?
  - What is the role of models and metaphors in scientific explanations?
- What teaching strategies can raise students' insight into the relevance, power and limitations of science?



# Stimulus for World of Physics in secondary and tertiary education

## Why and how to develop young people's insights into how physics, metaphysics and religion relate

*Researchers Dr Mehdi Nassaji, Zoe Knapp*

There is a considerable body of research which indicates that the perception that science and religion conflict is widespread among secondary school students (Fulljames, Gibson, & Francis, 1991; Keith S. Taber, Billingsley, Riga, & Newdick, 2011; Wilkinson, 2005).

Scientism is a commitment to the view that science is the only valid way to construct knowledge and that nothing exists beyond the material universe. Scientism can be a considered position – but it can also arise via an uncritical inference that a scientific answer is a complete answer to a big question. Our previous research investigated scientism in the context of Being Human and some selected comments by teenagers include:

*“I suppose everything you do is a result of the brain, but I feel uneasy saying that I'm not a person - I'm just a brain in a shell.”*

*“I'd still believe it's free will instead of just a mass of atoms, but I think it's because I like to believe that. I like to believe it's free will because then it shows that [...] there's more of a purpose to life.”*

**The proposed project is focused on physics and potential research questions are:**

1. To what extent is scientism present in students' discourses about physics?
2. Which questions – such as “Can laws of nature be broken?” can teachers use to stimulate enquiry and the surfacing of assumptions?
3. To what extent can teaching about physics within a ‘wider world of physics’ address the perception that science is necessarily scientific?

Stimulus materials for projects 3 and 4 will be distributed at lunchtime on the day



## References (Primary Plus Project)

- Byrne, E., & Brodie, M. (2013). *Cross Curricular Teaching and Learning in the Secondary School... Science*: Routledge.
- Fensham, P. J. (2016). The Future Curriculum for School Science: What Can Be Learnt from the Past? *Research in Science Education*, 1-21.
- Fulljames, P., Gibson, H. M., & Francis, L. J. (1991). Creationism, Scientism, Christianity and Science: a study in adolescent attitudes. *British Educational Research Journal*, 17(2), 171 - 190.
- Hanley, P., Bennett, J., & Ratcliffe, M. (2014). The Inter-relationship of Science and Religion: A typology of engagement. *International Journal of Science Education*, 36(7), 1210-1229.
- Ibrahim, B., Buffler, A., & Lubben, F. (2009). Profiles of freshman physics students' views on the nature of science. *Journal of Research in Science Teaching*, 46(3), 248.
- Martin-Hansen, L. M. (2008). First-year college students' conflict with religion and science. *Science & Education*, 17(4), 317-357.
- McComas, W. F., Clough, M. P., & Almazroa, H. (2006). The role and character of the nature of science in science education. In J. K. Gilbert (Ed.), *Science Education: Science, education, and the formal curriculum* (Vol. 1, pp. 28-58). London: Taylor & Francis.
- Ratcliffe, M. (2009). The place of socio-scientific issues in citizenship education. In A. Ross (Ed.), *Human Rights and Citizenship Education*. (pp. 12 - 16). London: CiCe.
- Smith, M. U., & Scharmann, L. (2008). A multi-year program developing an explicit reflective pedagogy for teaching pre-service teachers the nature of science by ostention. *Science & Education*, 17(2-3), 219-248.
- Summers, M., Kruger, C., & Childs, A. (2001). Understanding the science of environmental issues: Development of a subject knowledge guide for primary teacher education. *International Journal of Science Education*, 23(1), 33-53.
- Taber, K. S. (2009). *Progressing Science Education: Constructing the scientific research programme into the contingent nature of learning science*. Dordrecht: Springer.
- Taber, K. S., Billingsley, B., Riga, F., & Newdick, H. (2011). Secondary Students' Responses to Perceptions of the Relationship between Science and Religion: Stances Identified from an Interview Study. *Science Education*, 95(6), 1000-1025.
- Wilkinson, D. (2005). Hawking, Dawkins and The Matrix: science and religion in the media. In D. Alexander (Ed.), *Can we be sure about anything? Science, faith and postmodernism* (pp. 214-236). Leicester: Inter-Varsity Press.



## References (World of Physics)

Billingsley, B., Brock, R., Taber, K. S., & Riga, F. (2016). How Students View the Boundaries Between Their Science and Religious Education Concerning the Origins of Life and the Universe. *Science Education*, n/a-n/a. doi: 10.1002/sce.21213  
<http://onlinelibrary.wiley.com/doi/10.1002/sce.21213/abstract>

Collins, S., Osborne, J., Ratcliffe, M., Millar, R., & Duschl, R. (2001). *What 'ideas-about-science' should be taught in school science? A Delphi study of the 'expert' community*. Paper presented at the Annual Conference of the National Association for Research in Science Teaching, St Louis, MO.

