Written evidence submitted by Professor Alice Roberts (COM0035)

Public engagement with science benefits both scientists and the wider public. Scientists may gain a new perspective on their research, and discover new sources of insight, inspiration and innovation. Engagement is essential to ensure that research is socially relevant. As well as providing economic benefits, science and technology enrich our culture. Engagement with scientific research supports decision-making at an individual and societal level, and may help to encourage young people to choose to study and work in science and related areas.

Despite being such a great advocate of public engagement with science, I have become increasingly concerned about this last point. In particular, I feel that the language used around efforts to encourage young people to consider study and careers in science, does not always help the wider aims of engagement. There is also a degree of confusion when it comes to the problem of attracting women into scientific study and careers.

The acronym STEM (Science, Technology, Engineering and Mathematics) is widely used in education policy, but is interpreted in different ways. On the one hand, the term “science” is incredibly broad - but STEM does not usually encompass medicine or medical sciences.

If we identify a shortage of women studying and working in STEM subjects, this is a very difficult problem to tackle if we don’t know which subjects are being included in, or excluded from, this definition. There are plenty of young women choosing to study biology at school and university, for instance, but a dearth of young women choosing physics and engineering.

The government’s aim to increase the number of students studying STEM subjects (and to increase the proportion of women students) follows the policy in the US, which has attracted some criticism. The characterisation of STEM jobs as generally better paid does not reflect the diversity of such jobs - some very well paid, but some not. The language used to promote science can also be seen as denigrating to other areas of study or career choices. The education secretary, Nicky Morgan, has been severely criticised for saying that “many young people are making choices age 15 (ie: not choosing STEM subjects) which will hold them back for the rest of their lives.” Comments like this surely help to emphasise a gulf between science (good for the economy, good for the individual) and the arts and humanities (by implication - not so good). Nicky Morgan did respond to the criticism, saying that “we want young people to have access to a broad and balanced curriculum”. But our current education system allows only a narrow range of subjects to be studied at A level, perhaps encouraging

young people to think of themselves as either “scientists” or “non-scientists” from that point on. More than fifty years after CP Snow’s Rede Lecture, the divide between the Two Cultures still seems deep.

Finally, gender inequality and gender stereotyping both affects and is affected by public engagement with science. It is difficult to challenge perceptions of engineering and physics as “masculine” subjects if the vast majority of physicists and engineers are men. Promoting female role models in such areas may be extremely important. The balance may not be perfect, but BBC science programmes are presented by a range of male and female presenters. Prominent female presenters with expertise in physical sciences and engineering include Maggie Aderin-Pocock, Helen Czerski, Lucie Green and Danielle George. And yet, when science minister Jo Johnson gave his speech about the “Future of British Science” in January 2016, he mentioned ten men - and not one woman. In particular, when it came to “STEM capital”, he said “We have come a long way in the last decade in mainstreaming science, thanks in no small part to stars such as Brian Cox and Jim Al-Khalili and the important work of organisations like Science Grrl.” Science Grrl does excellent work, but it’s odd to mention an organisation alongside those two male examples, rather than any of the prominent female scientists on television. In terms of public engagement with science, and gender stereotypes, this speech rather successfully promoted the idea of science as an exclusively male endeavour.

There may be both an economic and moral imperative behind efforts to increase the proportion of girls studying and going on to work in areas of science and technology. But once again, not all areas of science are equal. There are plenty of young women studying biology at school, for instance, and going on to study medicine, veterinary and life sciences at university. Efforts to improve equality need to focus on those areas which exhibit inequality - subjects like physics and engineering. And there clearly needs to be much greater effort expended on retaining a good proportion of women in science and technology throughout careers. Schemes like Athena SWAN charter, promoting measures to such as training to lessen unconscious bias, and mentorship, are successful to some extent. But the problem really is much more fundamental - and was well articulated in the Science and Technology Committee’s 2014 report on Women in Scientific Careers: current career structures and provision of parental leave do not promote equality. One pertinent quote stood out: “the

academic career system was developed when most faculty members were men (with stay-at-home wives)".

Issues around gender equality and stereotyping may affect recruitment into science careers, but may also affect the likelihood of people engaging with science throughout their lives. This is often seen as socially and politically beneficial, helping to inform policy-making, for example. It can also help to inform individual choices. But perhaps above all - and something that is often lost or overlooked in discussions about public engagement with science - science enriches our culture. No-one doubts the economic importance of science, but let's not forget the fantastic stories that emerge from this approach to ourselves and the world around us.

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(Whilst I am Professor of Public Engagement with Science at the University of Birmingham, and Patron of the Association of Science and Discovery Centres, these comments are my own and do not represent the views of these institutions/organisations).

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