

## Higher Education in STEM Subjects

A response from the Society of Biology to the House of Lords Science and Technology Sub-Committee 1

16<sup>th</sup> December 2011

The Society of Biology is a single unified voice for Biology: advising Government and influencing policy; advancing education and professional development; supporting our members, and engaging and encouraging public interest in the life sciences. The Society represents a diverse membership of over 80,000 - including practising scientists, students and interested non-professionals - as individuals, or through the learned societies and other organisations listed below.

### Summary

- Trained scientists are of enormous value to the population in a range of research and non-research careers, and many employers welcome applicants with a scientific background to non-research based roles due to the transferable skills common to many STEM graduates including problem solving, critical thinking, analytical skills.
- We need more 16–18 year olds studying the appropriate combinations of sciences and mathematics at A level to ensure we produce enough STEM undergraduates to provide the UK's science base. Any cuts to funding for 16-19 education and subsequent increasing class sizes or decreasing resources available will have negative implications on practical teaching in sciences, when universities already report new undergraduates to lack these skills. Mathematical ability is widely quoted as insufficient in new STEM undergraduates.
- The STEM graduate career pipeline is not simply a route to an academic research position, and as such, graduates need to gain a range of transferable skills during their course in order to equip them for a range of potential roles. Reports from employers highlight that graduates are lacking generic transferable skills and research skills and experience, particularly basic mathematical and statistical capability, ability to apply scientific and mathematical knowledge, and practical and analytical skills. 43% of employers report a problem recruiting staff with the right STEM skills and increasingly employers tend to recruit candidates with at least Masters level qualification to ensure they have more of the desired skills.
- In order to ensure that sufficient numbers of graduates with the appropriate levels of skills are generated, employers need to play a key role in promoting study of STEM subjects and careers at all levels through training funds, bursaries, academic prizes and CASE studentships. Increasing the number of student placements offered and integration of these opportunities into degree programmes will highlight the potential vocational nature of STEM subject degrees.
- Research informed teaching is crucial in order to produce STEM graduates with the high level skills required for employment. The current focus of the Research Excellence Framework does not incentivise or recognise teaching and will lead to the emergence of further divisions between academics who focus on research and those with teaching responsibility. The decrease in HEFCE teaching funding will create a serious funding shortfall for laboratory subjects which are costly to teach such as the biosciences. The new level of HEFCE funding is wholly inadequate and some HEIs may decide that science programmes are unaffordable under the new funding regime.

Charles Darwin House, 12 Roger Street, London, WC1N 2JU Tel: +44 (0)20 7685 2550  
[info@societyofbiology.org](mailto:info@societyofbiology.org) [www.societyofbiology.org](http://www.societyofbiology.org)

- Until the system of fees and funding for Masters courses is developed, it is difficult to know how this will affect the uptake of Masters courses, and subsequent supply of PhD students. An increasing trend for HEIs and employers to accept only applicants who have a Masters qualification means that this will become increasingly important. Financial constraints will become an increasing factor in some able students choosing to continue studying beyond a three year undergraduate degrees.
- There is some concern that the training that UK postgraduate students receive does not compare favourably with research training abroad, where postgraduate training takes longer. Anecdotal evidence suggests that postgraduate students from the UK lose out on postdoctoral research positions to overseas applicants due to their decreased research training.

## General questions

### What is the definition of a STEM subject, and a STEM job? Do we understand demand for STEM graduates and how this could be used to influence supply?

1. STEM subjects include science, technology, engineering and maths, although some views include medicine. There is a common misconception that biology is not a STEM subject. This may be partly due to the fact that - unlike the other core sciences and maths - the biosciences, with the exception of biotechnology, have not been identified as a 'Strategic and Vulnerable Subject' (SIV)<sup>1</sup>. Although strategically important, the biosciences as a whole have not been considered vulnerable. This is in spite of the fact that understanding of biological systems (and many important discoveries) depends on utilising knowledge of chemistry, physics and mathematics. Further, there is a mismatch between supply and demand in professional skills in many biological disciplines and the BBSRC<sup>2</sup> identified whole animal physiology, industrial biotechnologies, plant and agricultural sciences and systematics and taxonomy as both strategically important for the UK and as vulnerable or likely to become so.
2. A recent report for the Science Council<sup>3</sup> found that 20% of the workforce is employed in science roles - a total of 5.8 million people, and these figures are set to grow. Of the current figures, 1.2m are classed as primary science workers - workers in occupations that are purely science based and require the consistent application of scientific knowledge and skills - and 4.6m are secondary science workers - workers in occupations that are science related and require a mixed application of scientific knowledge and skills alongside other skill sets.
3. This workforce included people working in a diverse range of sectors including research & development, education, ICT, health and consultancy as the largest fields. The transferable skills common to many STEM graduates – including problem solving, critical thinking, analytical skills - are valued by many businesses outside of STEM<sup>4</sup>.

## 16-18 supply

### Are schools and colleges supplying the right numbers of STEM students and do they have the right skills to study STEM first degrees?

4. The proportion of post 16 students taking maths and the sciences at A level is increasing<sup>5</sup>, although reports still state that we need more 16–18 year olds studying the sciences and mathematics at A level<sup>6</sup> to ensure we produce enough STEM undergraduates to provide the UK's science base.
5. Biology is the most frequently studied of the sciences at A level<sup>7</sup>, however a large proportion of students who study biology at A level chose to study biology with no additional sciences. Too many students later decide they would like to take biology further only to discover their choices limited future progression as most universities require students to have studied both biology and another science or maths subject at A level. This issue highlights a disparity in the quality of advice that young people are receiving at a critical point in their education. We welcome publications such as the Russell Group's Informed Choices guide<sup>8</sup> which provide students with information on the subjects required for admission to particular degree courses, and which highlights the importance of taking chemistry and maths alongside biology in order to study biology at HE.

<sup>1</sup> [http://www.hefce.ac.uk/learning/funding/201213/DefinitionofSIVS\\_byJACS30.xls](http://www.hefce.ac.uk/learning/funding/201213/DefinitionofSIVS_byJACS30.xls)

<sup>2</sup> Strategically Important and Vulnerable Capabilities in UK Bioscience, BBSRC Bioscience Skills and Careers Strategy Panel (2009) [http://www.bbsrc.ac.uk/web/FILES/Reviews/0905\\_bioscience\\_research\\_skills.pdf](http://www.bbsrc.ac.uk/web/FILES/Reviews/0905_bioscience_research_skills.pdf)

<sup>3</sup> The current and future UK science workforce, Science Council (2011)

[http://www.sciencecouncil.org/sites/default/files/UK\\_Science\\_Workforce\\_FinalReport\\_TBR\\_2011.pdf](http://www.sciencecouncil.org/sites/default/files/UK_Science_Workforce_FinalReport_TBR_2011.pdf)

<sup>4</sup> Ready to grow: business priorities for education and skills, CBI/EDI (2010)

<sup>5</sup> Joint Council for Qualifications data (2011) [http://www.jcq.org.uk/national\\_results/news\\_releases/2011/](http://www.jcq.org.uk/national_results/news_releases/2011/)

<sup>6</sup> Preparing for the transfer from school and college science and mathematics education to UK STEM higher education Royal Society (2011)

<http://royalsociety.org/education/policy/state-of-nation/higher-education/>

<sup>7</sup> Preparing for the transfer from school and college science and mathematics education to UK STEM higher education Royal Society (2011)

<http://royalsociety.org/education/policy/state-of-nation/higher-education/>

<sup>8</sup> Informed Choices, Russell Group (2011) <http://www.russellgroup.ac.uk/informed-choices.aspx>

6. Due to perverse accountability measures, schools are driven to put students through multiple re-sits with the focus of ensuring students get good grades (A-C), and this comes at the cost of preparing them adequately for university. Particular skills which universities cite as lacking in many students are critical thinking, the ability to study independently and specific practical skills and transferable skills including literacy and numeracy. In April 2011 the Gatsby Charitable Foundation<sup>9</sup> commissioned research on the standard of laboratory skills possessed by new undergraduate students in the 15 Russell Group universities in England (excluding the LSE). This report found that 100% respondents felt that new undergraduates lacked confidence in the lab and 57% felt that the level of laboratory skills had declined over the last five years. Universities find themselves in the position of having to incorporate these skills components into their teaching, when in fact these activities should begin at school. Mathematical ability is widely quoted as insufficient, and chemistry has also been highlighted as lacking.
7. We support comments from SCORE<sup>10</sup> that '*practical work should be intrinsic to the curriculum and be used not only to develop a pupil's understanding of scientific enquiry and practical skills but also to further a pupil's scientific knowledge and understanding*'. Practical science is costly to teach, in terms of time, and providing resources such as appropriate laboratory space and reagents and costs for travel for field trips. Any cuts to funding for 16-19 education<sup>11</sup> will have negative implications on practical teaching in sciences. Resulting measures such as increasing class sizes or decreasing resources available will threaten quality, with adverse effects on students progressing to higher education.

#### **What effect, if any, will the English Baccalaureate have on the study of STEM subjects in higher education?**

8. One of the aims of the English Baccalaureate is to increase the uptake of academic subjects at GCSE, including the individual sciences. We welcome this aim, although we have concerns that practical issues arising from the introduction of the English Baccalaureate may limit the number of students studying sciences at key stage 4 and beyond.
9. In order to accommodate the English Baccalaureate subjects within the timetable some schools may find themselves unable to offer the three separate sciences. Additionally, the marking system in which only the top two grades achieved from the three separate sciences are counted, may induce schools to pre-emptively concentrate teaching efforts on only two sciences. This could lead to decreased engagement with particular science subjects and potentially a decreased number of students studying STEM subjects at HE. We suggest the government conducts longitudinal research into the effects of the English Baccalaureate on the uptake of triple science and study of STEM in HEIs<sup>12</sup>.

### **Graduate supply**

**Is the current number of STEM students and graduates (from the UK, EU and overseas) sufficient to meet the needs of industry, the research base, and other sectors not directly connected with STEM? Is the quality of STEM graduates emerging from higher education sufficiently high, and if not, why not? Do STEM graduates have the right skills for their next career move, be it research, industry or more broadly within the economy?**

10. Approximately 10% of UK degrees awarded every year are classed as biological sciences<sup>13</sup> (although the definition of the biological sciences used for these statistics is very broad). A greater issue for the biosciences is the numbers of graduates with the desired skills for employment. Increasingly both employers, and HEIs searching for PhD students, tend to recruit candidates with research experience gained through an MSc/MRes or MSci/MBiol (rather than BSc) to ensure they have more of the desired skills and 43% of all employers report

---

<sup>9</sup> <http://www.gatsby.org.uk/Search-results.aspx?searchStr=Practical%20experiments%20in%20school%20science%20lessons%20and%20science%20field%20trips>

<sup>10</sup> <http://www.score-education.org/policy/wider-learning-experience/practical-work-in-science>

<sup>11</sup> 16-19 Funding Formula Review, Department for Education (2011)

<http://www.education.gov.uk/consultations/index.cfm?action=consultationDetails&consultationId=1777&external=no&menu=1>

<sup>12</sup> Evidence to the Education Select Committee inquiry on English Baccalaureate, SCORE (2011) <http://www.score-education.org/media/7895/ebacweb.pdf>

<sup>13</sup> HESA data, (2008/09) <http://www.hesa.ac.uk/>

a problem recruiting staff with the right STEM skills<sup>14</sup>. There is a significant mismatch between employer expectations and HE output - employers complain that there are not enough graduates with the right skills while students are unable to find jobs in the sector.

11. Reports on STEM graduates in general<sup>15</sup>, and also specifically on bioscience graduates<sup>16,17</sup> highlight that graduates are lacking both generic transferable skills and research skills and experience. These reports show that employers are most concerned about bioscience graduates lacking basic mathematical and statistical capability, ability to apply scientific and mathematical knowledge, and practical and analytical skills. Specific scientific skills change relatively rapidly as technology advances and techniques are adapted to different purposes (and are frequently automated), so to properly prepare a workforce in training it is important to teach basic skills, critical thinking, experimental approaches and ethics, as well as imparting fundamental knowledge.
12. There is a danger that these numerical skills are downgraded in bioscience courses and particularly in student assessment. Quantitative skills training is something that biological sciences students may individually seek to avoid in many cases, having chosen biology on the mistaken grounds that it is not a quantitative science. Universities may seek to avoid teaching essential but unpopular skills in the face of activities such as the National Student Survey.
13. However, we do note that not all graduates want or need advanced research skills, as they may not want to become researchers in the future. The STEM graduate career pipeline is not simply a route to an academic research position, and as such, graduates need to gain a range of transferable skills during their course in order to equip them for a range of potential roles. We stress the need for relevant careers advice for students, graduates and postgraduates, that remains current with the rapidly changing employment market, and that is accessible to as many people as possible. There is no dearth of advice available but not everyone who needs it will come looking for it and will think critically about its reliability and relevance to them. Also many students consider careers advice to be irrelevant when they are still unsure about careers and so do not engage with careers advice early enough.
14. We would also like to highlight the need to ensure that appropriate numbers of non-EU overseas STEM students and graduates are attracted to the UK, and warn of the potentially damaging implications for UK science and engineering of Government plans to end the right of migrants to settle in the UK.

### **What effect will higher education reforms have on the quality of teaching, the quality of degrees and the supply of STEM courses in higher education institutions?**

15. The Society of Biology has provided responses to many of the recent consultations on the higher education reforms; these can be found on our website<sup>18</sup>. Below we summarise some of the main consequences that we anticipate the proposed higher education reforms will have on the quality of STEM degrees and subsequent supply of skilled STEM graduates.
16. The decrease in HEFCE Teaching funding will create a serious funding shortfall for subjects which are costly to teach well, and this certainly includes all of the biosciences. The HEFCE additional funding of £1500 which is available to supplement fees from students taking Band B subjects is wholly inadequate and unrealistic. Science subjects are inherently costly to teach, and there are few cheap options for teaching them well, principally due to the vital elements of laboratory and fieldwork, which place demands upon both resource budgets and staff time. TRAC data indicate that the differential in teaching cost between laboratory-based sciences (the biosciences, chemistry, physics) and class-room based subjects, averaged across the sector, is currently of the order of £3000- £3500. In light of this HEIs may decide that science programmes are unaffordable under the new funding regime and will reduce them accordingly, focusing their attention on less costly subjects such as the humanities. Alternatively if HEIs aim to increase their bioscience undergraduate intake and reduce their unit costs by achieving 'economies of scale' this will inevitably damage the quality of teaching and of the student experience, through eliminating or reducing the highly-valued, but high-cost,

<sup>14</sup> Building for Growth, CBI/EDI (2011) [http://www.cbi.org.uk/media/1051530/cbi\\_edi\\_education\\_skills\\_survey\\_2011.pdf](http://www.cbi.org.uk/media/1051530/cbi_edi_education_skills_survey_2011.pdf)

<sup>15</sup> Building for Growth, CBI/EDI (2011) [http://www.cbi.org.uk/media/1051530/cbi\\_edi\\_education\\_skills\\_survey\\_2011.pdf](http://www.cbi.org.uk/media/1051530/cbi_edi_education_skills_survey_2011.pdf)

<sup>16</sup> Skills needs for biomedical research, ABPI (2008) <http://www.abpi.org.uk/our-work/library/industry/Pages/skills-biomedical-research.aspx>

<sup>17</sup> Report of Industry Survey on Accreditation of UK Bioscience Degrees, Society of Biology (2011)

<http://www.societyofbiology.org/documents/view/832>

<sup>18</sup> <http://www.societyofbiology.org/policy/consultations>

elements of bioscience study such as small-group teaching, individual contact time, laboratory and field work and individual research projects. It also imposes practical limitations on the subject matter which can be approached and the hands-on skills which can be taught. A major driver for the year on year loss of practical work from bioscience programmes has been their cost, yet the skill set provided by such experience is precisely what employers want.

17. The Government has stated that 65,000 places are to be made available for students achieving AAB grades or above at A-level or equivalent and, by implementing a 'core and margin' model, 20,000 places will be allocated to HEIs whose average charge is at or below £7,500<sup>19</sup>. These proposals could initiate an unwelcome approach to provision by incentivising the development of a low-cost element to the HE sector, with prioritisation of recruitment of high-performing students to non-science subjects. Many HEIs may focus their recruitment efforts on AAB+ students to non STEM subjects, given the financial incentive for recruiting students to classroom-based courses rather than to science courses. Many organisations, including ourselves<sup>20</sup>, have expressed concerns over the effects of this proposal on the overall numbers of STEM students. HEFCE responded to these concerns by excluding SIV course non AAB+ students from the cut in order to create a margin. As the biosciences, with the exception of biotechnology, are not classed as a SIV, the potential for a negative impact on teaching in the biosciences is retained.
18. With the government's creation of the concept of the "good student" with AAB+ grades in any subjects, students who wish to study sciences at university may find it more difficult to get the highest grades than do those who wish to study humanities. University offers for science subjects will often include multiple required A level subjects, whereas for the humanities, students will typically have one or no A levels specified for their course, allowing them more power to choose the A level subjects which are likely to give them the highest grades.
19. We are keen that there are measures put in place to review the effect of these new proposals on student and graduate choices in strategically important disciplines such as the sciences. We ask that the Government perform longitudinal studies on the impact of the HE reforms on the willingness of graduates to study STEM subjects at HE and to pursue research careers.

**What is the relationship between teaching and research? What effect does "research assessment" have upon the ability to develop new and cross-disciplinary STEM degrees? Is it necessary for all universities to teach undergraduates and post graduates and conduct research? What other delivery model should be considered?**

20. Research informed teaching is crucial in order to produce STEM graduates with the high level skills required for employment in STEM careers. This teaching should include appreciation and delivery of the component skills of research, as well as exposure to an active research environment in order to embed knowledge, understanding and skills.
21. The current focus of the Research Excellence Framework (REF) does not incentivise or recognise teaching or research laboratory-based project supervision, which will lead to the emergence of further divisions between academics who focus on research and those with teaching responsibility. Whilst academics perceive that the only way to promotion is via grants and papers, the perception of the importance of teaching will decrease and its priority will be devalued. This loss of collegiality erodes the student experience at the higher end and weakens skills delivery and added value. It is important that undergraduates are taught by research active scientists who have experience of the latest techniques. We encourage measures to highlight the importance of teaching at HE, such as HE teaching awards, Continued Professional Development focusing on teaching in Higher Education, and clear routes to promotion which recognise the importance of teaching as well as research. The Society of Biology<sup>21</sup> and several of our Member Organisations offer such schemes.
22. In terms of alternative delivery models we strongly oppose any move towards fast-track two-year degrees as a new norm for strongly skills-based disciplines like the biosciences. It is important to note that our international

---

<sup>19</sup> Higher Education White Paper: Students at the heart of the system, Department for Business, Innovation and Skills ( 2011) <http://discuss.bis.gov.uk/hereform/white-paper/>

<sup>20</sup> A joint response from the Institute of Physics, the Royal Society of Chemistry, and the Society of Biology to the Department for Business, Innovation & Skills' consultation on the Higher Education White Paper <http://www.societyofbiology.org/documents/view/799>

<sup>21</sup> <http://www.societyofbiology.org/education/hei/competition>

commitments under the Bologna agreement push us in a different direction, proposing a *minimum* of three years for undergraduate degrees. It is our belief that science degrees will increasingly require four years of study; Chemistry and Physics have already moved significantly towards four year integrated Masters degrees as the entry route to research based careers, and this is an increasing trend in the biosciences.

### **Does the UK have a sufficient geographical spread of higher education institutions offering STEM courses?**

23. As research resources are increasingly focused into narrower 'islands of excellence', even in research active institutions the proportion of well-funded researchers falls. In these cases strenuous effort must be made to maintain integration of these staff into the teaching agenda, and ensuring that degrees in STEM subjects are not lost. The concentration of research into a few elite institutions will lead to geographical limitations on studying STEM which would certainly have widening participation implications, particularly if it occurs in areas of low university density. More students are staying closer to home in order to reduce costs of higher education. A more interesting question to ask is whether there is a sufficient geographical spread of *high quality* STEM courses.

### **Post-graduate supply**

#### **Is the current training of PhD students sensitive to the range of careers they subsequently undertake? Are we currently supporting the right number of PhD studentships to maintain the research base and are they of sufficient quality?**

24. A recent report from the Science Council<sup>22</sup> highlighted the importance of scientific training to the workforce. It splits the working population into primary science workers in occupations that are purely science-based; secondary science workers in occupations that are science related and require a mixed application of scientific knowledge and skills alongside other skill sets, and non-science workers. Trained scientists are of enormous value to the population in a range of research and non-research careers, and many employers welcome applicants with a scientific background to non-research based roles due to their analytical skills.
25. The skills required for a successful research career in the past have been largely undefined. At present many graduate schools are beginning the process of identifying these skills and are putting in place more targeted training programmes. Despite the availability of several excellent resources for postgraduate researchers such as the Vitae website<sup>23</sup>, not all early career researchers are aware of the diverse range of careers facilitated by research; in some situations the advice and resources offered during this training lag behind.
26. There is some concern that the training that UK postgraduate students receive does not compare favourably with research training abroad, where postgraduate training takes longer. Anecdotal evidence suggests that postgraduate students from the UK lose out on postdoctoral research positions to overseas applicants due to their decreased research training. Concern has been expressed that through increasing the formalities required by postgraduate students such as upgrades and appraisals, this further decreases the time students spend in the lab. We recommend that postgraduate students are encouraged to publish their research findings in peer-reviewed journals and collaborate with researchers in other institutions and/or industry during their PhD study to increase their research experience.
27. The Research Councils are reducing the number of PhD students in STEM areas by focusing on priority research areas, and increasing the resource per individual student to extend studentships to four years. It is unclear whether this reduced number of PhD students will result in a contraction of opportunity. In the medium term the reforms to the higher education system are likely to reduce the number of graduates intending to and/or available to follow a research career. However this may be a positive move if increased quality of training and career advice provides the opportunity for these graduates and employers to more fully appreciate the quality of the training and therefore the skills of qualified postdoctoral researchers.

#### **Should state funding be used to promote Masters degrees and is the balance right between the number of Masters degree students and PhD students?**

<sup>22</sup> The current and future UK science workforce, Science Council (2011)

[http://www.sciencecouncil.org/sites/default/files/UK\\_Science\\_Workforce\\_FinalReport\\_TBR\\_2011.pdf](http://www.sciencecouncil.org/sites/default/files/UK_Science_Workforce_FinalReport_TBR_2011.pdf)

<sup>23</sup> Vitae <http://www.vitae.ac.uk/>

28. Until the system of fees and funding for Masters courses is developed, it is difficult to know how this will affect the uptake of Masters courses, and subsequent supply of PhD students. An increasing trend for HEIs to accept only PhD applicants who have a Masters qualification<sup>24</sup> – either a stand-alone MSc or MRes or an undergraduate Integrated Masters qualification such as an MBIol or MSci – is likely to drive an increased uptake in Masters degree courses in order for students to gain the skills needed to be accepted for a PhD position. We welcome the fact that postgraduate funding will be addressed in the next HEFCE consultation on HE funding and suggest that state funding should be used to support students undertaking Masters level qualifications, through a system of loans, although not at the expense of PhD funding. We also note that Masters courses need to be meaningful, and not simply taken by students as they are unsure of what to do next in their career, and again stress the importance of relevant careers advice.

#### **What impact will higher education reforms have on the willingness of graduates to pursue a research career?**

29. With the increased costs of undergraduate study, many students may feel unable to afford to continue into postgraduate study, particularly as there is no current route of funding for students to take taught Masters courses. With the new fee system, financial constraints will become an increasing factor in some able students choosing to continue studying beyond a three year undergraduate degree. In turn this will have a negative impact on the sector, potentially with Masters level courses closing, having a knock on effect on further study. We are pleased to see that postgraduate funding and support will be addressed in a forthcoming HEFCE consultation, and hope the Government will monitor the impact of the new fees regime.
30. Factors which decrease the willingness of graduates to pursue research careers include the lower comparative pay for British scientists in comparison to those in the USA or Germany, or in comparison to other sectors outside research; the lack of job stability and stress that comes from frequent job hunting; the red tape and regulation of the research industry; and the contracting HE sector which, even if only short-term, influences student decisions and therefore the long term skills supply.

### **Industry**

#### **What incentives should industry offer to STEM graduates in order to attract them?**

31. The CBI/EDI education and skills survey<sup>25</sup> identified that 52% of employers expect difficulty recruiting STEM staff in the next three years. In order to ensure that sufficient numbers of graduates with the appropriate levels of skills are generated, employers need to play a key role in promoting study of STEM subjects and careers at all levels.
32. Incentives for STEM students could include industry training funds and bursaries for undergraduate students; offers to contribute towards paying off student loans on employment; and sponsoring research council PhD CASE studentships; as well as academic prizes for younger students to help promote the study of STEM subjects to students at a younger age, and inspire them towards a future in STEM. Increasing the number of student placements offered – which can range from four weeks to a year - and work experience or shadowing opportunities offered by companies would help to make STEM graduates more likely to pursue careers in this area. Integration of these opportunities into degree programmes would highlight the potential vocational nature of STEM subject degrees, and provide crucial training opportunities for the skills employers require.

#### **What steps are industry and universities taking together to ensure that demand for STEM graduates matches supply in terms of numbers, skills and quality of graduates?**

33. We broadly support the aim set out in the Government's Higher Education White Paper, Students at the Heart of the System,<sup>26</sup> earlier this year to encourage interaction between universities and businesses, and welcome

---

<sup>24</sup> PhD study: Trends and profiles 1996-97 to 2009-10, HEFCE (2011) [http://www.hefce.ac.uk/pubs/hefce/2011/11\\_33/](http://www.hefce.ac.uk/pubs/hefce/2011/11_33/)

<sup>25</sup> Building for Growth, CBI/EDI (2011) [http://www.cbi.org.uk/media/1051530/cbi\\_edi\\_education\\_skills\\_survey\\_2011.pdf](http://www.cbi.org.uk/media/1051530/cbi_edi_education_skills_survey_2011.pdf)

<sup>26</sup> Department for Business, Innovation and Skills Higher Education White Paper: Students at the heart of the system 2011 <http://discuss.bis.gov.uk/hereform/white-paper/>

the Wilson Review of Business-University Collaboration. On issues such as widening participation and promotion of STEM as a subject of choice, where industry and HEIs are each working independently, joint programmes may be both more effective and more economic.

34. With the changing landscape of the pharmaceutical industry, HEIs are finding it more difficult to develop links with such organisations, and it is harder to monitor many relationships with smaller organisations than it was to foster links with a small number of large organisations. Umbrella organisations such as the Association of the British Pharmaceutical Industry and the Bioindustry Association have a key role to play in facilitating discussions and particularly the Society of Biology in our unique position to act as one voice for the biosciences. The Society of Biology's vision is to represent all who are committed to biology in academia, industry, education and research; to facilitate the promotion and translation of advances in biological science for national and international benefit, and to engage and encourage public interest in the life sciences.
35. In particular the development of our Degree Accreditation Programme<sup>27</sup> features industry and academia working together to recognise academic excellence in the biosciences, highlighting degrees which educate the research and development leaders and innovators of the future. When fully rolled-out across all the biosciences, accreditation will recognise outstanding biosciences courses across the UK that focus not only on core knowledge but also on experimental and analytical skills. It is our hope that Degree Accreditation will provide employers with assurance over the levels of laboratory and fieldwork experience provided by a degree, and the coverage of key areas of expertise required for further employment in specialist scientific careers. Accreditation will also make it easier for students to choose degrees which will equip them for future scientific careers.

---

<sup>27</sup> <http://www.societyofbiology.org/education/hei/accreditation>

We gratefully acknowledge the specific contributions of a Task Force (Chair: Dr Hilary MacQueen, Open University; Dr Sandra Kirk, Nottingham Trent University; Dr Jeremy Pritchard, University of Birmingham; Dr Malcolm East, University of Southampton; Prof Jeremy Ward, Kings College London; Dr Ruth Bastow, GarNET; Karen Devine, British Ecological Society; James Lush, Biochemical Society; Jess Strangward, British Pharmacological Society; as well as written submissions from Thomas Mercer, Cardiff University.

The Society of Biology is pleased for this response to be publically available. For any queries, please contact Society of Biology, Charles Darwin House, 12 Roger Street, London, WC1N 2JU. Email: [education@societyofbiology.org](mailto:education@societyofbiology.org)

## Member Organisations represented by the Society of Biology

### Full Members

Anatomical Society  
 Association for the Study of Animal Behaviour  
 Association of Applied Biologists  
 Biochemical Society  
 Biosciences KTN  
 Breakspear Hospital  
 British Andrology Society  
 British Association for Lung Research  
 British Association for Psychopharmacology  
 British Crop Production Council  
 British Ecological Society  
 British Lichen Society  
 British Microcirculation Society  
 British Mycological Society  
 British Neuroscience Association  
 British Pharmacological Society  
 British Phycological Society  
 British Society for Ecological Medicine  
 British Society for Immunology  
 British Society for Matrix Biology  
 British Society for Medical Mycology  
 British Society for Neuroendocrinology  
 British Society for Parasitology  
 British Society for Plant Pathology  
 British Society for Proteome Research  
 British Society for Research on Ageing  
 British Society for Soil Science  
 British Society of Animal Science  
 British Toxicology Society  
 Experimental Psychology Society  
 Fisheries Society of the British Isles  
 Genetics Society  
 Heads of University Biological Sciences  
 Heads of University Centres of Biomedical Science  
 Institute of Animal Technology  
 International Biometric Society  
 Laboratory Animal Science Association  
 Linnean Society of London  
 Marine Biological Association  
 Nutrition Society  
 Royal Entomological Society  
 Royal Microscopical Society  
 Science and Plants for Schools  
 Scottish Association for Marine Science  
 Society for Applied Microbiology  
 Society for Endocrinology  
 Society of Environmental Medicine

Society for Experimental Biology  
 Society for General Microbiology  
 Society for Reproduction and Fertility  
 Society for the Study of Human Biology  
 SCI Horticulture Group  
 The Physiological Society  
 Tropical Agriculture Association  
 UK Environmental Mutagen Society  
 University Bioscience Managers' Association  
 Zoological Society of London

### Supporting Members

Association of the British Pharmaceutical Industry (ABPI)  
 Association of Medical Research Charities  
 AstraZeneca  
 BioIndustry Association  
 BioScientifica Ltd  
 Biotechnology and Biological Sciences Research Council (BBSRC)  
 BlueGnome Ltd  
 GlaxoSmithKline  
 Huntingdon Life Sciences  
 Institute of Physics  
 Lifescan (Johnson and Johnson) Scotland Ltd  
 Medical Research Council (MRC)  
 Oxford University Press  
 Pfizer UK  
 Royal Society for Public Health  
 Syngenta  
 The British Library  
 Unilever UK Ltd  
 Wellcome Trust  
 Wiley Blackwell