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Life Sciences Industrial Strategy: Who's driving the bus?

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See Appendix 1.

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Evidence is published online at http://www.parliament.uk/life-sciences-industrial-strategy and available for inspection at the Parliamentary Archives (020 7129 3074).

Q in footnotes refers to a question in oral evidence.

SUMMARY

The life sciences sector is the flagship for the Government's Industrial Strategy. But who is leading the delivery of the Life Sciences Industrial Strategy? To whom are they accountable? What power do they have to harness Government departments and the NHS? These questions are at the heart of this inquiry.

The Business, Energy and Industrial Strategy Secretary and the Health and Social Care Secretary, together with the Prime Minister, have raised high expectations of the Life Sciences Industrial Strategy in the business, charity and academic sectors. Sir John Bell's report, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector* has been welcomed widely. The importance of the life sciences sector to this country is well documented. Now is the time to convert that enthusiasm and commitment into action.

So far, Government action has been wholly inadequate. This inquiry has uncovered complicated arrangements for implementation, a lack of clear authority and accountability and a failure to engage the NHS effectively. In its turn, the NHS's commitment to the strategy has so far been incoherent, uncoordinated and ineffective. This raises questions about the Government's commitment to implementing the Life Sciences Industrial Strategy.

But all is not lost. Prompt and vigorous action by the Government can save the day. This strategy has already secured the commitment of the business, charity and academic communities. But the central role of the NHS in the life sciences means only the Government can take the lead.

We recommend that there should be sweeping simplification of the implementation arrangements: a single body, the Life Sciences Governing Body, should be responsible for the delivery of the Life Sciences Industrial Strategy. The Business, Energy and Industrial Strategy Secretary and the Health and Social Care Secretary must ensure it has the cross-Government backing it needs to do its work.

We recommend that the implementation of the Industrial Strategy, not least in the life sciences, should be scrutinised by a new Office for Industrial Strategy, reporting directly to Parliament.

The UK performs well in translating basic science into innovation. However, we heard compelling evidence that this country is less successful at growing small and medium-sized firms into larger companies. Sir John Bell sets the aim of four massive UK life sciences companies being created over the next 10 years. If this is to be realised, there must be a significant increase in the scale of patient investment capital available to innovative firms in the sector to enable them to grow over many years.

We are impressed by the Government's initial response to the Patient Capital Review. Now this needs to be carried forwards. Further action is required to relax the rules on the allocation of pension fund assets to invest in the long-term growth of research-intensive businesses. Proposals for these rules need to be backed by similar levels of commitment to the implementation of the Life Sciences Industrial Strategy.

The Government has an opportunity right now to get ahead of international competition. It can, and must, take bold steps to secure the future growth and expansion of the life sciences sector. This is even more vital as the UK prepares for life outside the European Union.

Life Sciences Industrial Strategy: Who's driving the bus?

CHAPTER 1: INTRODUCTION

The life sciences sector

1. The UK life sciences sector is high-tech, research-intensive, scientifically diverse and innovative. It makes a significant contribution to the UK economy and to the health and wellbeing of the population. According to one analysis, it contributed £30.7bn to the economy in 2015 and supports 482,000 jobs.[1] As the UK prepares for life outside the European Union, it is essential that the UK continues to have a strong life sciences sector which can grow and expand quickly.

2. In this report, "life sciences" refers to the application of biology and technology to health improvement, including biopharmaceuticals, medical technology, genomics, diagnostics and digital health. This is the definition used by Sir John Bell in his report, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, which was central to our inquiry.[2] See paragraph 15 for a discussion of the scope of this definition.

3. The NHS is central to the UK life sciences sector and provides the UK with a unique selling point to offer to the life sciences industry and those who invest in it. The life sciences sector has a distinctive resonance with the population of the UK, principally because of its close links with healthcare and the NHS.

Background to inquiry

4. Successive governments have emphasised the importance of the life sciences sector. In recent years:

    - The Coalition Government published a UK Life Sciences Strategy in 2011, which was re-launched in 2013. The 2011 Life Sciences Strategy contained a number of "key actions". These included an early access scheme for innovative new therapies, a £310m investment to support the commercialisation of research, an enhanced UK clinical trials gateway and high-level apprenticeships.[3]

    - In 2014 the Government commissioned the Accelerated Access Review to consider speeding up access to innovative drugs, devices, diagnostics and digital products for NHS patients.[4] The review was independently

1 PwC, *The Economic contribution of the UK Life Sciences industry* (March 2017), p 4: https://www.abpi.org.uk/media/1371/the_economic_contribution_of_the_uk_life_sciences_industry.pdf [accessed 23 March 2018]

2 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector* (August 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf [accessed 23 March 2018]

3 Department for Business Innovation and Skills and Office for Life Sciences, *Strategy for UK Life Sciences* (December 2011): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32457/11-1429-strategy-for-uk-life-sciences.pdf [accessed 23 March 2018]

4 Accelerated Access Review, *Terms of Reference*: https://www.gov.uk/government/organisations/accelerated-access-review/about/terms-of-reference [accessed 23 March 2018]

chaired by Sir Hugh Taylor (former Permanent Secretary at the then Department of Health) and supported by the Wellcome Trust. It published its final report in October 2016.[5]

- In November 2016 the Prime Minister, the Rt Hon Theresa May MP, announced a Patient Capital Review, to be led by HM Treasury, which would "identify barriers to access to long-term finance for growing firms".[6] We were aware from our previous work on the Government's Industrial Strategy Green Paper[7] that the availability of so-called "patient" capital[8] in the UK was a problem for developing innovations and growing new companies in many sectors, including life sciences.

- In January 2017 the Government published a Green Paper on the Industrial Strategy (hereafter referred to as the Green Paper) which stated that Professor Sir John Bell would work on a strategy and early sector deal for life sciences, "to make the UK the best place in the world to invest in life sciences".[9]

5. Against this background in July 2017 we decided to carry out an inquiry into Life Sciences and the Industrial Strategy. We knew that Government work in this area was ongoing and so were not surprised when, during our inquiry, the following events took place:

   - Sir John Bell's report, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*[10] was published on 30 August 2017 (hereafter referred to as the Bell report);

   - The Government responded to the final report of the Accelerated Access Review[11] on 3 November 2017;

   - On 22 November 2017 the Patient Capital Review: Industry Panel Response was published[12] alongside the Government's response to the financing growth in innovative firms consultation;[13]

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5 Accelerated Access Review, *Final Report: Review of innovative medicines and medical technologies* (October 2016): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/565072/AAR_final.pdf [accessed 23 March 2018]

6 HM Treasury and the Department for Business, Energy and Industrial Strategy, *Terms of reference for the Patient Capital Review* (November 2017): https://www.gov.uk/government/publications/patient-capital-review/terms-of-reference-for-the-patient-capital-review [accessed on 23 March 2018]

7 Letter from Chairman of the Committee, Lord Selborne, to Secretary of State for Business, Energy and Industrial Strategy, 2 May 2017: https://www.parliament.uk/documents/lords-committees/science-technology/Industrial-strategy/2017–05-02-Industrial-strategy-ltr-to-BEIS-Secretary-of-state.pdf

8 Patient capital is another name for long term capital. With patient capital, the investor is willing to make a financial investment in a business with no expectation of gaining a quick profit. Instead, the investor is willing to forgo an immediate return in anticipation of more substantial returns further in the future.

9 Department for Business, Energy & Industrial Strategy, Green Paper, *Building our Industrial Strategy* (January 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/611705/building-our-industrial-strategy-green-paper.pdf [accessed 23 March 2018]

10 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*

11 Department for Health and Social Care and Department for Business, Energy and Industrial Strategy, *Accelerated Access Review: response* (3 November 2017): https://www.gov.uk/government/publications/accelerated-access-review-response [accessed 23 March 2018]

12 Patient Capital Review Industry Panel, *Industry Panel Response* (22 November 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661397/PCR_Industry_panel_response.pdf [accessed 23 March 2018]

13 HM Treasury, *Financing growth in innovative firms: consultation response* (22 November 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661398/Patient_Capital_Review_Consultation_response_web.pdf [accessed 23 March 2018]

- On 27 November 2017 the Government published its Industrial Strategy White Paper, *Industrial Strategy: building a Britain fit for the future*[14] (hereafter referred to as the White Paper); and
- On 6 December 2017 the Government published the first phase of the Life Sciences Sector Deal.[15]

Our inquiry

6. The Government has not set out clearly which documents comprise the Life Sciences Industrial Strategy. We and most of our witnesses understand Sir John Bell's report and the Life Sciences Sector Deal to together comprise the strategy. As such, they represent the first sector strategy[16] produced under the present Government's Industrial Strategy. It provides a benchmark for other sector strategies and deals which will follow. It represents an opportunity to provide a successful model, aspects of which can be replicated in other sectors. Conversely, if it fails the whole Industrial Strategy will be called into question.

7. Most of the evidence raised the same important issues which we have sought to draw out. We have focused on those issues that require immediate action to ensure the development and expansion of the UK's life sciences sector. We believe this will be most helpful to the Government as it implements the Life Sciences Industrial Strategy.

Structure of our report

8. Much of the evidence we received, whilst broadly welcoming Sir John Bell's report, related to the challenges of implementation. In Chapter 2 we consider these challenges and make recommendations. In Chapter 3 we consider the role of the NHS and how it can both benefit from the strategy and contribute to its success. Chapter 4 considers action needed to increase access to finance for companies within the sector. Chapter 5 concentrates on the challenges of ensuring the sector has access to a skilled workforce. The evidence showed that the UK's excellent science base attracts private sector investors in the life sciences from around the world. In Chapter 6 we consider how this can be maintained and enhanced in the future.

Acknowledgements

9. We received a large volume of oral and written evidence in response to our call for evidence (see Appendix 3). On 31 October 2017 we visited the Francis Crick Institute and took oral evidence there from Sir Paul Nurse, Director and Chief Executive, and five scientists based at the Institute. We are grateful to Sir Paul Nurse and the staff of the Francis Crick Institute, and to all those who gave evidence to the inquiry. We are also grateful to our specialist adviser for this inquiry, Professor Graeme Reid, Chair of Science and Research Policy at University College London, for his expertise and

14 Department for Business, Energy & Industrial Strategy, *Industrial Strategy: Building a Britain fit for the future*, Cm 9528, 27 November 2017: https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future [accessed 23 March 2018]

15 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal* (December 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/665452/life-sciences-sector-deal-web-ready-version.pdf [accessed 12 April 2018]

16 In this report "Life Sciences Industrial Strategy" refers to the Bell report and the Life Sciences Sector Deal together. Where we refer to just one of these documents we use the terms "Bell report" and "sector deal".

enthusiasm. We are also grateful to the Committee staff who worked on the inquiry: Anna Murphy (Clerk); Dr Daniel Rathbone (Policy Analyst); and Cerise Burnett-Stuart (Committee Assistant).

Government response and next steps

10. We look forward to receiving a written response to this report from the Government and we will seek a debate in the House as soon as possible thereafter.

CHAPTER 2: CHALLENGES OF IMPLEMENTATION

11. We welcome the Bell report, as did most of those who gave evidence to this inquiry. Whilst it does not contain proposals for implementation, it provides an analysis of and a vision for the life sciences sector. It was followed by the publication of the first phase of the Life Sciences Sector Deal on 6 December 2017.[17]

12. If implemented—across the relevant Government departments, the NHS, industry, academia, charities and the financial sector—the Life Sciences Industrial Strategy will make a major contribution to the future economic prosperity of the UK. Much effort has gone into creating the strategy and much expectation has been raised personally by the Rt Hon Greg Clark MP, Secretary of State for Business, Energy and Industrial Strategy, and the Rt Hon Jeremy Hunt MP, Secretary of State for Health and Social Care.

13. It became clear to us during this inquiry that the Life Sciences Industrial Strategy stands little chance of success without a detailed plan for implementation and clear lines of authority, responsibility and accountability. The role of the NHS in the life sciences sector (which we consider in detail in Chapter 3) means that the industry-driven approach the Government has adopted with other sectors to implement the Industrial Strategy will not work and the Government must drive the implementation of the Life Sciences Industrial Strategy.

The Bell report

14. The Bell report contains recommendations for the Government and the life sciences sector.[18] It has been welcomed by the Government and was accompanied by a series of announcements of funding from the Secretary of State for Health and Social Care and the Secretary of State for Business, Energy and Industrial Strategy.[19]

15. In the foreword to his report, Sir John Bell indicated that it dealt with the health life sciences sector, which he defined as "the application of biology and technology to health improvement, including biopharmaceuticals, medical technology, genomics, diagnostics and digital health".[20] We are aware that the term could also include, for example, biotechnology, agriculture, plant science, animal science and climate change mitigation and adaptation. The exclusion of these runs the risk that they will be neglected.

16. ***We recommend that the Government should identify and publish the areas of life sciences not covered by the Bell report and the Life Sciences Sector Deal. Businesses and investors in parts of the life sciences not covered will then know the areas in which they are free to propose further sector deals.***

17 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal*

18 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*

19 HM Government, Press release: 'Sir John Bell to unveil industry-led proposals to build UK's status as world leader in life sciences', 30 August 2017: https://www.gov.uk/government/news/sir-john-bell-to-unveil-industry-led-proposals-to-build-uks-status-as-world-leader-in-life-sciences [accessed 4 April 2018]

20 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 3

17. While the Government has talked of having a "life sciences industrial strategy"[21] and "supports the vision and aims of the [Bell report]"[22] it has avoided any explicit acceptance of responsibility for the delivery of all of Sir John's recommendations. The Rt Hon the Lord Henley, Parliamentary Under Secretary of State at the Department for Business, Energy and Industrial Strategy (the BEIS Minister), told us that "it is Sir John Bell's report … it is not a Government report".[23] He also told us the Government is bound by the Life Sciences Sector Deal[24] and that he would "endorse some of Sir John Bell's ambitions without saying that they are Government targets".[25] The Government reiterated this point in its supplementary written evidence:

> "The Strategy is not a government document; it is a sector (which includes industry, charities and academia) document which makes recommendations to Government on ways to ensure the UK remains a top-tier global hub for clinical research and medical innovation."[26]

18. ***There is some ambiguity about the status of the Bell report and its implementation. We recommend that the Government should adopt the Bell report in full and provide an implementation plan to which it and the other stakeholders can be held to account.***

Importance of implementation

19. Whilst the evidence we heard welcomed the Bell report, many witnesses pointed out that it did not contain the detail required for its successful implementation.[27] We heard different views on how the Bell report and the Life Sciences Sector Deal should be implemented but all witnesses agreed that a detailed implementation plan is vital to their success.

20. Witnesses pointed to the 2011 Life Sciences strategy as an example of what can happen if a strategy is not implemented effectively. The 2011 strategy was considered a partial success by many witnesses but some of its recommendations were not implemented because of a lack of an adequate implementation plan and clear accountability. Roche, a Swiss multinational healthcare company that operates in the UK, told us that the absence of timelines for implementation may have contributed to problems with the implementation of the 2011 Life Sciences strategy.[28] GSK, a British pharmaceutical company, echoed that, saying that "implementation where it happened was piecemeal and did not follow the holistic, joined-up structure of the Strategy".[29] The Association of the British Pharmaceutical Industry (ABPI) told us that based on their experience of the previous strategy the following would help ensure the success of the Life Sciences Industrial Strategy:

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21 Q 283 (Lord Henley)
22 Supplementary written evidence from HM Government (LSI0132)
23 Q 276 (Lord Henley)
24 *Ibid.*
25 Q 275 (Lord Henley)
26 Supplementary written evidence from HM Government (LSI0132)
27 Written evidence from British Heart Foundation (LSI0023), Q 14 (Prof James Stirling CBE), Q 49 (Mike Thompson) and Q 60 (Sir Paul Nurse)
28 Written evidence from Roche (LSI0073)
29 Written evidence from GSK (LSI0115)

"A clear plan with responsibilities and milestones.

A governance structure that is able to hold Government, NHS England, research partners and the life sciences sector (industry and non-profit) to account.

Annual public reports of progress."[30]

21. The Government initiated the Industrial Strategy, defined its framework and is publishing documents relating to it. While industry needs to be involved in implementing the Bell report, only the Government can lead the process of drawing up an implementation plan against which the Government, the NHS and industry can be held accountable. The implementation plan can then be delivered by an independent body, as suggested by Dr Michael Hopkins, Senior Lecturer at the Science Policy Research Unit, Sussex University, and GSK.[31] GSK added that this body should be made up of a wide range of stakeholders. This needs to be done quickly because, in the words of Sir John Bell, it is "crucial … to make sure that we maintain momentum [and] deliver the things in the report".[32] The BEIS Minister agreed, saying that "publishing the industrial strategy on its own is not enough; it is about how we maintain the momentum".[33] It is disappointing therefore that the Minister also told us that he could not guarantee when we might start to see changes as a result of the Bell report and the Life Sciences Sector Deal.[34]

22. **The evidence we have heard, particularly about the failings of the 2011 Life Sciences Strategy, has highlighted the importance of a detailed implementation plan that contains timelines, milestones and metrics for measuring success. The Bell report provides the vision for the sector; the Government must now work with stakeholders to draw up an implementation plan.**

Sector Deal

23. The White Paper describes sector deals as "partnerships between the Government and industry on sector-specific issues [that] can create significant opportunities to boost productivity, employment, innovation and skills".[35]

24. The Government told us that "the publication of the [Bell report] on 30th August marked the start of negotiations on a Sector Deal between Government and the life sciences sector".[36] A Life Sciences Sector Deal was subsequently published on 6 December 2017.[37]

25. Erik Nordkamp, Chair of the American Pharmaceutical Group (APG), told us that in countries with successful life sciences sectors government and industry work together in partnership, rather than in a transactional

30 Written evidence from the Association of the British Pharmaceutical Industry (ABPI) (LSI0102)
31 Q 169 (Dr Michael Hopkins) and written evidence from GSK (LSI0115)
32 Q 199 (Sir John Bell)
33 Q 274 (Lord Henley)
34 *Ibid.*
35 HM Government, *Industrial Strategy: Building a Britain fit for the future*, Cm 9528, 27 November 2017, p 192: https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future [accessed 22 March 2018]
36 Q 276 (Lord Henley)
37 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal*

way, as they have in the UK in the past.[38] The BEIS Minister told us that the Industrial Strategy "is fundamentally about a partnership between Government and industry".[39]

26. The Government describes the Life Sciences Sector Deal as bringing together government, universities, charities and more than 25 businesses to make a joint commitment to invest in all parts of the UK.[40] However the Sector Deal is presented as two separate lists: what the sector is doing and what the Government is doing. There is little sign of joining up and no distinction between what would have happened anyway and what has been initiated specifically by the Bell report. **The Government remains focused on a transactional relationship with rather than a strategic partnership with the life sciences sector. This is inadequate.**

27. MSD, an American pharmaceutical company investing in the UK, told us that "it is important the Sector Deal has clear metrics and deliverables in place in order to measure implementation, which includes clear accountability across all stakeholders".[41] The Government's written evidence stated:

> "Once agreed, the Sector Deal will include an implementation plan, with metrics, governance and oversight arrangements to ensure that success can be measured against objectives."[42]

28. No such implementation plan is included in the Sector Deal as published and it does not contain any metrics, milestones or timeframes for implementation. The Sector Deal says that a Sector Deal Oversight board would meet in January 2018 to agree an implementation plan. We are not aware that this meeting took place.

29. The Government said that some of the Bell report's recommendations may not fit in to a sector deal and "it is right that the Government identifies these and proposes alternative policy development and implementation mechanisms".[43]

30. **The first phase of the Life Sciences Sector Deal as published does not constitute a plan that will ensure the successful implementation of the Bell report. The Sector Deal is designed along the lines of those for other sectors. It does not take account of the important and central role of the NHS which necessitates greater Government involvement in the life sciences sector.**

31. **We are disappointed that the Sector Deal does not contain the metrics, governance and oversight arrangements that the Government had promised in its written evidence. It lacks operational detail on how different arms of the Government will work together towards a single objective. Furthermore, it does not provide information about the provision and allocation of resources for many strands of implementation (particularly those involving the NHS).**

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38 Q 181 (Erik Nordkamp)
39 Q 272 (Lord Henley)
40 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal*
41 Written evidence from MSD (LSI0100)
42 Written evidence from HM Government (LSI0111)
43 Supplementary written evidence from HM Government (LSI0132)

Implementation bodies

32. When we asked Ministers what bodies would be responsible for implementation they seemed to conflate operational arrangements for implementation with oversight, naming a number of bodies but giving no information about the operational arrangements that will be vital to the timely and effective implementation of the Bell report or the Life Sciences Sector Deal.[44] In Box 1 we list the bodies which the Government has named.

33. We asked the Government for more information on the various proposed bodies. This information was provided in supplementary written evidence. It was inadequate because:

- The full membership of the Life Sciences Industrial Strategy Implementation Board has not been finalised;
- The draft terms of reference do not provide sufficient detail on how the Life Sciences Industrial Strategy Implementation Board will function:
- It does not explain how the Board will interact with the Life Sciences Council or the numerous other bodies that are to sit under the council (see Box 1).[45]

Box 1: Government bodies related to Life Sciences

Life Sciences Council
Sector Deal Oversight Board
Life Sciences Industrial Strategy Implementation Board
EU Relationship Group
Health Technology Partnership
Medicines Manufacturing Industry Partnership
Innovation, Research and Clinical Data Group
Accelerated Access Collaborative
Patient Access Partnership
Independent Industrial Strategy Council

Source: Supplementary written evidence from HM Government (LSI0132), Department for Business, Energy & Industrial Strategy and Office for Life Sciences, Life Sciences Sector Deal (December 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/665452/life-sciences-sector-deal-web-ready-version.pdf [accessed 12 April 2018] and HM Government, Industrial Strategy: Building a Britain fit for the future, Cm 9528, 27 November 2017: https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future [accessed 23 March 2018]

44 Q 274 (Lord Henley, Lord O'Shaughnessy)
45 Supplementary written evidence from HM Government (LSI0132)

34. ***As a minimum, the Government must clarify urgently:***

- ***Which bodies are responsible for each aspect of operational delivery of implementation;***
- ***The membership of these bodies;***
- ***Their terms of reference; and***
- ***The authority these bodies will have to coordinate policy and delivery across Government departments.***

In paragraph 49 we set out our proposals for the implementation of the strategy which go beyond the minimum standards set out above.

Interaction with the wider Industrial Strategy

35. The Life Sciences Industrial Strategy is one element of the Government's wider Industrial Strategy. We received evidence from the Association of Medical Research Charities that the "alignment between the overarching industrial strategy and the Sector Deal for the Life Sciences is vital"[46] and that it is important that "the Life Sciences Strategy, wider Industrial Strategy, and regional strategies are implemented in a co-ordinated and complementary manner".[47]

36. Some aspects of the Life Sciences Industrial Strategy such as skills, immigration and finance lie, as the Rt Hon the Lord Heseltine CH told us, outside the responsibilities of BEIS and the Department of Health and Social Care (DHSC), "Government should think across, not just within, the disciplines".[48] The ABPI explained that collective action across the Government was vital because, "a pick and mix approach delivers a patchy environment which may not compete as well with other countries also seeking to attract investment".[49] We focus on skills and immigration in Chapter 5 and on finance in Chapter 4.

37. **The Government should propose and obtain agreement from all stakeholders to an implementation plan for the Bell report and the Life Sciences Sector Deal, which must be integrated with the implementation of the overall Industrial Strategy.**

Leadership, monitoring, accountability and oversight

38. Many witnesses told us that leadership, clear accountability for and oversight of the implementation of the Life Sciences Industrial Strategy (as opposed to the actual process of implementation) are important if the strategy is to succeed. The Campaign for Science and Engineering told us that "the early progress made in the 2011 strategy was hindered by a lack of accountability and loss of leadership".[50]

39. We were told that ultimate responsibility for the strategy should lie with the two Secretaries of State; for Business, Energy and Industrial Strategy and Health and Social Care. Professor Chris Whitty, Chief Scientific Adviser,

46 Written evidence from Association of Medical Research Charities (AMRC) (LSI0098)
47 Written evidence from Loughborough University (LSI0033)
48 Q 143 (Lord Heseltine)
49 Written evidence from ABPI (LSI0102)
50 Written evidence from Campaign for Science and Engineering (CaSE) (LSI0076)

Department of Health and Social Care and Interim Government Chief Scientific Adviser, told us "the role of the Secretary of State [for Health and Social Care] … is going to be absolutely essential … if you excluded them from having a major role in this the chances of success would be very low".[51] Sir John Bell echoed this point: "if the two Secretaries of State do not have the time to commit to this, it [is] probably not worth doing".[52]

40. The BEIS Minister told us that the proposed Life Sciences Council, co-chaired by the two Secretaries of State along with the chief executive officer of the pharmaceutical company AstraZeneca, will provide "Cabinet level oversight".[53]

41. It has not yet been announced who the remaining members of the Council will be, the terms on which they will be appointed, what authority the Council will have over other Government departments or what its terms of reference will be. The BEIS Minister told us that "the appointments will be made by Government on the advice of industry and others, to make sure that we get a broad range of people covering … industry … the NHS, academe and other areas".[54] He said that the first meeting of the Council would probably not happen until April 2018.[55]

42. An independent Industrial Strategy Council is to provide oversight of the wider Industrial Strategy, including the Life Sciences Industrial Strategy, but there is little detail in the White Paper of who will appoint this Council, the authority it will be given, its terms of reference and to whom it will be accountable. The BEIS Minister told us that "it will not be a statutory body" and "it will have the power to make reports and recommendations and to tell us where we have got it wrong".[56] He was unable to say who would serve on the Council.[57]

43. This uncertainty is unsatisfactory. We set out our proposals for oversight of the Industrial Strategy in paragraph 51.

Devolved administrations

44. Many witnesses told us that the devolved administrations must be involved in implementing the strategy. The Medical Schools Council (MSC) and the Association of UK University Hospitals (AUKUH) told us that it will be "important that attention is paid to the NHS in all four devolved nations for the impact of this report to be realised".[58] The ABPI and the Academy of Medical Sciences also told us that engagement and collective action with the devolved administrations was important.[59]

45. We were disappointed to hear from the Life Sciences Scotland Industry Group, which is responsible for the Scottish Life Sciences Strategy, published in February 2017, that the Office for Life Sciences is "currently not strongly

51 Q 162 (Prof Chris Whitty)
52 Q 199 (Sir John Bell)
53 Supplementary written evidence from HM Government (LSI0132)
54 Q 274 (Lord Henley)
55 *Ibid.*
56 Q 276 (Lord Henley)
57 Q 274 (Lord Henley)
58 Written evidence from Medical Schools Council and the Association of UK University Hospitals (LSI0081)
59 Written evidence from ABPI (LSI0102) and Academy of Medical Sciences (LSI0107)

enough engaged with the regions and devolved administrations".[60] Lord O'Shaughnessy, Parliamentary Under Secretary of State at the Department of Health and Social Care (the Health Minister), said he had not had discussions with the devolved administrations about the life sciences strategy.[61]

Our proposal for implementation and oversight of the Life Sciences Industrial Strategy

46. **The Government must clarify exactly which documents comprise the Life Sciences Industrial Strategy. This is still unclear and successful implementation cannot be achieved until it is clarified. Most witnesses told us that they understand the strategy to be the Bell report and the Life Sciences Sector Deal and we have adopted that definition.**

47. ***Implementation and oversight are vital to the success of both the Life Sciences Industrial Strategy and the wider Industrial Strategy. The Government's plans for implementation and oversight do not provide an effective model and as set out are a recipe for failure. Not only do they lack clarity and detail, they fail adequately to take account of the central role of the NHS in the life sciences sector.***

48. ***In the following paragraphs we set out our proposal for delivery, accountability and leadership which, drawing on the Government's model and suggestions made to us by witnesses, sets out a clear and effective system for implementing the Life Sciences Industrial Strategy. See also Figure 1, which shows our proposal in the form of a diagram.***

Life Sciences Governing Body

49. ***The Government's system for implementation is too complex and duplicative. We recommend that, in place of the Life Sciences Implementation Board and the Life Sciences Council, there should be a single body (referred to hereafter as the Life Sciences Governing Body) responsible for the delivery of the Life Sciences Industrial Strategy, which should:***

    - ***Be co-chaired by the Secretary of State for Business, Energy and Industrial Strategy and the Secretary of State for Health and Social Care with executive leadership from Sir John Bell as Life Sciences Champion;***
    - ***Meet frequently;***
    - ***Have a membership of about 12, including senior figures from the NHS, industry, academia and the charities sector;***
    - ***Take the lead in drawing up an implementation plan, with clear milestones, timelines and criteria for success;***
    - ***Task subordinate working groups with the actual operational delivery of specific areas of the plan; and***
    - ***Report to a Cabinet Committee.***

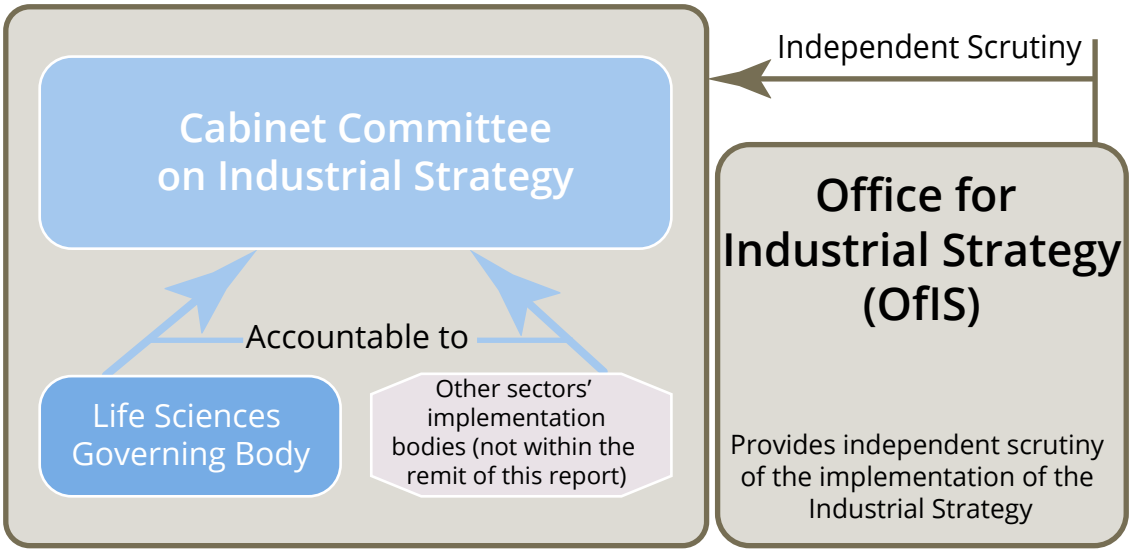
60 Written evidence from Life Sciences Scotland Industry Group (LSI0042)
61 Q 284 (Lord O'Shaughnessy)

50. ***The Secretaries of State for Business, Energy and Industrial Strategy and Health and Social Care should ensure the Life Sciences Governing Body has the backing required to do its work and should take responsibility for the cross-Government aspects of the strategy.***

Oversight—Office for Industrial Strategy

51. ***We recommend the creation of a new statutory body, the Office for Industrial Strategy (OfIS) with the authority to scrutinise the implementation of the wider Industrial Strategy and the Life Sciences Industrial Strategy and to publish its findings. The remit of the OfIS should cover the implementation of the Patient Capital Review. The OfIS would be accountable to Parliament and report annually on progress made by each Government department in implementing the Industrial Strategy.***

Figure 1: Our proposal for implementation and oversight of the Life Sciences Industrial Strategy



CHAPTER 3: ROLE OF THE NHS

52. The Bell report says the NHS is "potentially an enormous asset for those attempting to discover and develop new, innovative products and to properly test their utility in a healthcare system".[62] Furthermore, exploiting NHS data has the potential greatly to benefit patient care, UK firms and the economy more widely. The NHS differentiates the UK from the rest of the world providing a unique selling point to the life sciences sector.

53. We heard repeatedly that the NHS is vital to the successful implementation of the Life Sciences Industrial Strategy and the Health Minister told us that "the NHS part is critical" to the Strategy.[63] However, we heard consistent evidence, including from the NHS itself, that the NHS does not currently have the capacity to rise to the challenge of implementation.[64] Concerns were also raised about deeply embedded characteristics of the NHS—such as its highly federated structure—which limit its ability to adopt successful innovations and to diffuse them throughout the organisation. However, the Health Minister said he "would not call [the NHS] a weak player … I think it is a willing player".[65]

Co-ordination of NHS bodies

54. We heard that there is a lack of coordination between NHS bodies including—the DHSC, NHS England, NHS Improvement, foundation trusts and Clinical Commissioning Groups—which will be a barrier to implementing the Life Sciences Industrial Strategy. The evidence suggests there have been no high-level discussions on implementing the strategy across the NHS. When it was put to NHS Improvement that there was no co-ordinated activity or discussions related to the Life Sciences Industrial Strategy and its implementation within the NHS, Miles Scott, Improvement Director at NHS Improvement, told us "[the Strategy] is not the centrepiece of what the NHS is trying to do. It is not a significant part of our engagement with NHS trusts and NHS foundation trusts in and of itself".[66]

55. Sir John Bell told us that:

> "The senior people I have interacted with … want to see the health service deal with [the uptake and spread of innovation]; … The problem is … it is not clear who is driving the bus … Whoever is driving the bus, the windscreen wipers do not work and the exhaust is falling off."[67]

NHS and innovation

56. Almost all the evidence we received said that the NHS was poor at adopting innovation at scale. GSK told us that the NHS "offers a very powerful mechanism to both stimulate and benefit from … innovation" but "we are a long way from realising the full potential of the NHS".[68] AstraZeneca said that for the UK to "retain and attract more and new investment … companies need to see increased use by the NHS of the resulting innovations".[69]

62 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 50
63 Q 273 (Lord O'Shaughnessy)
64 Q 97 (Ian Dodge), Q 61 (Sir Paul Nurse), Q 207 (Sir John Bell), Q 56 (Sir Robert Lechler), Written evidence from NHS Innovations South East (LSI0010), P3 Medical Ltd (LSI0029), the Association of British Healthcare Industries (ABHI) (LSI0091) and Birmingham Health Partners (LSI0034)
65 Q 279 (Lord O'Shaughnessy)
66 Q 261 (Miles Scott)
67 Q 225 (Sir John Bell)
68 Written evidence from GSK (LSI0115)
69 Written evidence from AstraZeneca (LSI0117)

57. Smaller businesses that work with the NHS also criticised its uptake of innovation. Mark Campbell CBE, Senior Manager at Randox Laboratories, told us that if Randox Laboratories "had to survive on the income from innovation, we could not do it. The issue is … the NHS … and its ability to adopt quickly".[70] The Health Minister acknowledged that "one of the concerns is not that innovations cannot get a foothold but that they do not often get beyond that foothold. They might be trialled in a few [NHS] Trusts or departments, but then they are not spread".[71] Professor Dame Sally Davies, Chief Medical Officer for England, said that the fact the NHS is not a single body exacerbated the problem for industry, making the spread of innovation more difficult.[72]

58. NHS England told us that it sees innovations as either 'additive' or 'substitutive'. Additive innovations are additional to existing services. Substitutive innovations replace existing services with a better, more efficient service.[73] They told us that "even if additive inventions are cost-effective, they may not always be affordable within the NHS budget". However, if innovations are substitutive and "are proven to be genuinely cost-saving or cost-neutral in real world trials" they are much easier to adopt, particularly when budgets are constrained.[74] Randox Laboratories said that "silo-budgeting" within the NHS could prevent even substitutive innovations from being adopted.[75]

59. Sir John Bell told us that one of the reasons why the NHS struggles with adopting innovations is because " [it is] struggling to do even simple things well. The idea that you are going to put a whole lot of this really sexy techrelated stuff on top is challenging".[76] He also told us that the current structure of the NHS does not allow discussions to take place about what existing treatments or pathways should be stopped to allow the introduction of new innovations: ""You want the new drug. Okay. If you, the doctors, want the new drug, what are you going to give up? It must add better value than you get from the existing thing". I do not think we do that".[77]

60. Ian Dodge, Director of Innovation at NHS England, told us that the challenge was to connect innovation and life sciences with NHS core business, in the face of external constraints including "living within … our toughest funding settlement". He went on to say that this "means making sure that, when we are supporting industry … we are really clear about what the benefits will be to the NHS".[78]

61. **The current structure of the NHS stifles innovation. A focus on cost-control and a lack of co-ordination between the various bodies that make up the NHS means that the adoption and spread of innovations is not given the priority it requires. Unless the NHS's ability to adopt and spread innovations is improved, it will not be able to play a full role in the implementation of the Life Sciences Industrial Strategy. This will endanger the success of the strategy.**

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70 Q 27 (Mark Campbell CBE)
71 Q 273 (Lord O'Shaughnessy)
72 Q 164 (Dame Sally Davies)
73 Written evidence from NHS England (LSI0114)
74 *Ibid.*
75 Written evidence from Randox Laboratories Ltd (LSI0063)
76 Q 219 (Sir John Bell)
77 Q 222 (Sir John Bell)
78 Q 97 (Ian Dodge)

62. ***NHS England and NHS Improvement must give the highest priority to the adoption and spread of innovation throughout the NHS. They should work together to align their strategies to maximise the chances of success in this area.***

Existing initiatives

63. We heard about initiatives such as the Academic Health Science Networks (AHSNs) and the Small Business Research Initiative (SBRI), which aim to help with the adoption and spread of innovation in the NHS.

64. Since 2013, NHS England has funded a national network of 15 AHSNs to act as a bridge between academia, industry and the NHS, supporting researchers and innovators to deliver change in the NHS. NHS England told us that they are the "NHS distribution network for innovation".[79] P3 Medical Ltd, a medical device manufacturer, welcomed the AHSNs and thought their role should be expanded.[80]

65. There was however widespread concern that AHSNs do not have sufficient resources to operate effectively. Professor Sir Robert Lechler, President of the Academy of Medical Sciences and Executive Director of King's Health Partners Academic Health Sciences Centre, told us: "I do not think [Academic Health Science Networks] have the resources to [drive adoption of innovations], but I believe they genuinely have the opportunity to do that".[81] The AHSN Network echoed this point, "AHSNs are bodies put in place to support [changes in practice and clinical pathways]: however sufficient funding and encouragement for those rolling out treatment options have not been built around this structure".[82]

66. NHS Innovations South East suggested an audit to assess the effectiveness of AHSNs.[83] The Health Minister said that there are "probably too many pathways" for innovation in the NHS and that "there needs to be a simplification and rationalisation so that we can get those products not only started and piloted, but diffused".[84]

67. The Cell and Gene Therapy Catapult told us about research commissioned by the UK BioIndustry Association (BIA) in March 2017, which found that "staff across the NHS are generally unaware of the challenges around the adoption of innovation and have little or no awareness of previous government initiatives aimed at addressing these challenges and improving the uptake of new treatments".[85]

68. After we heard evidence from NHS England they published a paper *12 Actions to Support and Apply Research in the NHS* in November 2017. We view this as a step forward in the involvement of the NHS in the life sciences strategy and welcome two of the actions:

79 Written evidence from NHS England (LSI0114)
80 Written evidence from P3 Medical Ltd (LSI0029)
81 Q 56 (Sir Robert Lechler)
82 Written evidence from AHSN (Academic Health Science Networks) Network (LSI0028)
83 Written evidence from NHS Innovations South East (LSI0010)
84 Q 276 (Lord O'Shaughnessy)
85 Written evidence from the Cell and Gene Therapy Catapult (LSI0108)

- "Back AHSNs to become the main local NHS delivery vehicle for spreading innovations.
- Review and simplify the number of different national innovation projects and programmes."[86]

Financial incentives for innovation

69. Dame Julie Moore, Chief Executive of University Hospitals Birmingham NHS Foundation Trust, told us that financial incentives, such as best practice tariffs for trusts that show rapid adoption of innovations, could be a way forward.[87] Professor Keith McNeil, Chief Clinical Information Officer Health and Social Care at NHS England, said that, "We have to incentivise [innovation] by making it as important as your financial outcomes and patient outcomes… If you measure it and make it part of a [key performance indicator] for a CEO and a hospital trust, it will happen".[88]

70. The Health Minister told us that the innovation and technology tariff "rewards the uptake of innovation" but that this was one of many possible routes to innovation uptake.[89] Sir John Bell told us that "the activation energy to get innovation into a system is very real and it costs money. Even though the effectiveness of savings may be seen over time, it costs money to get it in place".[90] It might help increase the uptake of innovations if financial help is available to trusts to help them overcome this "activation energy".

71. ***The NHS should give greater priority to the uptake and spread of innovation and to rewarding clinicians and managers who make such adoption successful. We recommend that the Government should explore how it can offer financial incentives to those NHS trusts that adopt and spread proven innovations.***

72. ***The Academic Health Science Networks have a role to play in driving the adoption at pace and scale of innovations throughout the NHS. Where they are working well AHSNs should be further developed. AHSNs should have a clear link to the Life Sciences Governing Body (see paragraph 49).***

73. ***We recommend that NHS England should mandate the uptake of those innovations that have been shown to improve patient outcomes and provide good value for money.***

Healthcare data

74. The Bell report says that "one of the most important resources held by the UK health system is data generated by the 65 million people covered within it".[91] Witnesses told us that the exploitation of healthcare data, with adequate privacy safeguards, is one of the big commercial and healthcare opportunities identified in the strategy. Professor Bryan Williams, Director of R&D at University College London Hospitals, explained:

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86 NHS England, *12 Actions to Support and Apply Research in the NHS* (November 2017), p 4: https://www.england.nhs.uk/wp-content/uploads/2017/11/08-pb-30-11-2017-supporting-and-applying-research.pdf [accessed 1 February 2018]
87 Q 45 (Dame Julie Moore)
88 Q 98 (Prof Keith McNeill)
89 Q 276 (Lord O'Shaughnessy)
90 Q 222 (Sir John Bell)
91 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 56

> "Almost the entire population is covered by a single healthcare provider from birth to death, and we have comprehensive records somewhere on everybody. The ability to utilise that for drug discovery, monitoring the effectiveness of treatments and understanding the underlying basis of disease is enormous, and we have not realised that potential."[92]

75. Professor McNeil explained that it is not just patient data from clinical care that the NHS has access to but data about clinical trials, which if harnessed could shorten clinical trials and improve the uptake of new treatments.[93] The Health Minister said that using existing NHS data could "radically reduce the cost of clinical trials".[94]

76. Witnesses highlighted several problems that needed to be overcome to realise fully the potential of healthcare data. Professor McNeil told us that NHS data "is not structured; it is not standardised; it is not linked; it is not joined up" and this makes it difficult to realise its benefits.[95]

77. Whilst maintaining privacy and ensuring informed consent from patients are important, they could be potential barriers to using healthcare data. The Royal Academy of Engineering told us that "informed consent and confidentiality are clearly of particular importance … it is vital that a patient-centric approach is taken to discuss and explain the benefits to patients and society of sharing data, alongside any risks".[96]

78. Dame Julie Moore said that, whilst the public argument about the use of NHS data for research had not yet been won, since University Hospitals Birmingham NHS Foundation Trust introduced digital systems for outpatients, not one patient had refused consent to the collection of their data.[97] The Health Minister said that "reassurance needs to be given to provide people with the confidence that the NHS can hold their data and that it will be used appropriately".[98]

79. Healthcare data and digital technologies provide an opportunity for the NHS to improve the adoption of innovations that can lead to improvements in patient outcomes as well as cost savings. For example, health monitoring apps could reduce hospital admissions by leading to earlier interventions by GPs or pharmacists. To take advantage of these opportunities, the NHS needs the right structures and must learn from experience.

80. Dame Julie Moore told us that when University Hospitals Birmingham NHS Foundation Trust started using video-conferencing for outpatient appointments "we were told, 'The patient has not turned up and we [the commissioners] are not paying for it'". Consequently, in the first year after the Trust introduced virtual outpatient appointments it lost £400,000.[99] While this had since been corrected with a new digital tariff, it illustrates how existing structures can inhibit the uptake of innovations.

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92 Q 44 (Prof Bryan Williams)
93 Q 99 (Prof Keith McNeil)
94 Q 278 (Lord O'Shaughnessy)
95 Q 99 (Prof Keith McNeil)
96 Written evidence from Royal Academy of Engineering (LSI0096)
97 Q 44 (Dame Julie Moore)
98 Q 279 (Lord O'Shaughnessy)
99 Q 44 (Dame Julie Moore)

81. Sir John Bell told us that "when NHS data is being used there needs to be a tangible return to the NHS". He feared a large US tech company would use NHS data to develop algorithms that it then sold from the US, without paying tax in the UK or employing anyone in the UK. He said he had asked the DHSC to think about how it wants to manage that risk.[100]

82. **The problems standing in the way of exploitation of NHS healthcare data for the benefit of patients and the wider economy were explained to us by many witnesses. We did not, however, receive commensurate evidence about the possible solutions to them. This is probably in part because the focus of our inquiry was on the Life Sciences Industrial Strategy rather than the NHS. The Government has set out some early, welcome steps in the Life Sciences Sector Deal, including the establishment of Digital Innovation Hubs which we hope will go some way to tackling this.**

83. ***We recommend that the Government should develop solutions to the following problems associated with exploiting NHS patient data:***

- ***collection of data in a usable, standardised format across the NHS;***
- ***the ability to link different systems across the NHS;***
- ***access to NHS data by third parties and rules for commercial exploitation; and the***
- ***public acceptance of and trust in the use of healthcare data for patient benefit and research.***

These solutions might include financial incentives for Trusts, a role for AHSNs in setting up Digital Innovation Hubs as described in the Life Sciences Sector Deal, a sustained and substantial public engagement campaign and the involvement of the proposed Centre for Data Ethics and Innovation.

HARP

84. The Bell report places emphasis on the formation of the Health Advanced Research Programme (HARP). The report described HARP as:

> "Aimed at encouraging industry to take on bold, far-sighted ambitions in the life sciences to potentially create whole new industries based in the UK. The intention should be to create commercial success by leading and developing new industrial sectors underpinned by novel technology and higher risk science."[101]

85. HARP programmes would have multiple partners and funders. The Bell report defined HARP by reference to the Defence Advanced Research Projects Agency (DARPA) in the United States.[102] The principle of HARP

100 Q 218 (Sir John Bell)
101 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 14
102 The Defence Advanced Research Projects Agency (DARPA) is an agency of the United States Department of Defence responsible for the development of emerging technologies for use by the military.

has broadly been welcomed, including by the Government.[103] However, there is a lack of detail about how it might operate or be funded. The Government has said that further proposals on HARP will be made in later phases of the Life Sciences Sector Deal.

86. Concerns were raised about HARP. Sir Paul Nurse considered it was a good thing but difficult to deliver well.[104] Sir Robert Lechler said it was unclear where funding for HARP would come from: "what remains to be clarified is whether HARP is just folded into the Industrial Strategy Challenge Fund … whether there is a pot of money yet to be identified that will fund life sciences-type challenges".[105]

87. **While we welcome the ambition that lies behind the HARP proposal, we find the analogy to DARPA in the USA misleading. HARP will not have the scale or context of DARPA and should be conceived around the opportunities and needs of the UK. The Government must also clarify the sources and scale of funding for HARP.**

103 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal*, p 10
104 Q 67 (Sir Paul Nurse)
105 Q 55 (Sir Robert Lechler)

CHAPTER 4: FINANCE AND COMMERCIALISATION

88. In its Industrial Strategy Green Paper, the Government stated that Sir John Bell had "offered to lead work on a new strategy to make the UK the best place in the world to invest in life sciences".[106] His strategy included the following strategic goals:

- Create four UK companies valued at greater than £20 billion market cap in the next 10 years; and
- Attract 10 large (£50–250m capital investment) and 10 smaller (£10–50m capital) investments in life science manufacturing facilities in the next five years.[107]

89. In the Life Sciences Sector Deal, the first of the Government's policies was to "Raise total research and development investment to 2.4% of GDP by 2027".[108] This repeats a commitment in the Conservative Party manifesto before the 2017 general election.

UK success at innovation

90. We heard from business, investors and academics that the UK performs well in translating basic science into innovation through university spin-outs and other early-stage businesses. Professor James Stirling CBE, Provost of Imperial College London, said, "if you look at the research volume required to generate one spin-out company or to generate a patent and you compare the numbers, you find that, in fact, the UK and the US are entirely comparable".[109] Professor Philip Nelson, Chair of Research Councils UK, praised the UK's strong and internationally competitive science base.[110] Sir John Bell pointed out that the UK has more small biotech firms than anywhere else in Europe.[111]

91. The UK was highly praised as a location for business-university collaboration. The ease with which businesses can collaborate with universities in the UK acts as a magnet for research and development investment by business. Dr David Hughes, Head of Global R&D Technology Scouting at Syngenta, said that Syngenta had, "over 500 R&D collaborations with external partners globally, but over 30% of those are in the UK. It is by far the single most important country for collaborative research".[112] **The ability of research universities in the UK to attract global R&D investors to this country should make a significant contribution to the Government's commitment to raise R&D investment to 2.4% of GDP by 2027. It is a further reason—if one is needed—to support the very best basic science in the UK.**

92. Notwithstanding this, we were told that there were significant issues that need to be addressed around support for early-stage companies in this sector. Kings College London called for, "Innovate UK [to] do more to support university spin-out companies".[113] MedCity termed the provision of early-stage funding for spin outs from higher education "patchy".[114]

106 Department for Business, Energy & Industrial Strategy, *Building our Industrial Strategy*
107 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*
108 Department for Business, Energy & Industrial Strategy and Office for Life Sciences, *Life Sciences Sector Deal*
109 Q 9 (Prof James Stirling CBE)
110 Q 21 (Prof Philip Nelson)
111 Q 198 (Sir John Bell)
112 Q 114 (Dr David Hughes)
113 Written evidence from Kings College London (LSI0070)
114 Written evidence from MedCity (LSI0032)

93. We also heard that citations and publishing papers were over-used as measures of researchers' success. Dr Simon Boulton, a Senior Group Leader at the Francis Crick Institute, told us:

> "We [academics] are judged based on our productivity, where we publish our work … There might be strategies that provide an alternative measure of somebody's achievements, for example through the kind of work that we do in our laboratories, in terms of discoveries that we publish."[115]

Professor Joyce Tait, representing the Royal Society of Edinburgh, told us that approaches to evaluating impact as well as citations are needed and this is done to a limited extent through the Research Excellence Framework (REF). Professor Tait went on to say that the REF could be further improved if it "evaluate[s] the research of some academics purely on an impact basis, not necessarily on their contribution to highly-rated refereed journals".[116] We welcome the growing emphasis on impact in the REF.

Difficulty in growing companies

94. We received consistent and persuasive evidence that the UK is less successful in growing small and medium-sized firms into much larger companies. On several occasions, overseas investors have acquired growing UK firms as they become medium sized. The Bell report contains a goal to develop four companies within the sector with a market capitalisation in excess of £20 billion in the next 10 years.

95. However, as Dr Michael Hopkins and Dr Geoffrey Owen showed, the UK has generated only one such firm since 1980.[117] Dr Hopkins explained that:

> "In the US only 10 companies of that size have emerged since the mid-1970s and its sector is currently 10 times larger than the UK, in term of the public companies. … Of course, a decade is a long time. It is possible that the pound could devalue to some extent … It is also conceivable that large pharmaceutical companies, such as AstraZeneca or GSK, could spin out large businesses, but it is certainly a very ambitious target as it stands."[118]

The USA, on the other hand, is highly successful in growing highly-capitalised biotech firms. Sir John Bell told us that whilst he was optimistic that the UK could reach the four firms target, "if we got two or three I would be happy".[119]

96. **Without endorsing the specific targets that the Bell report sets, we agree that the UK's historic poor performance in this area is a concern because real economic value comes not from funding start-ups but from enabling scale-up.**

115 Q 72 (Dr Simon Boulton)
116 Q 58 (Prof Joyce Tait)
117 Geoffrey Owen and Michael M Hopkins, *Science, the State and the City: Britain's struggle to succeed in biotechnology* (Oxford: OUP, 2016)
118 Q 175 (Dr Michael Hopkins)
119 Q 233 (Sir John Bell)

Why is the UK poor at growing companies?

97. We were told that the biggest barrier to growing life sciences firms in the UK was the comparative lack of long-term investment or "patient" capital. This is a problem for the life sciences sector because of the long maturation time for many life sciences technologies.

98. Mike Thompson, Chief Executive Officer of the ABPI, told us:

> "Growing into a reasonable-sized pharmaceutical company is expected to take up to 20 years. Most venture capitalists want to cash out in six to eight years. There has been a gap in the funding available to have that long-term investment."[120]

Babraham Research Campus said, "patient capital is essential if true commercial benefit is to be gained from scientific discoveries".[121] MedCity told us, "the gap between [supply and demand] of long-term, patient capital is also a major limiting factor for innovative companies in Europe and particularly the UK".[122]

99. The situation in the USA is different. Dr Andrew Elder, a Partner at Albion Capital, told us, "On average, the US funds on the venture end of the spectrum are larger and continue to hold and follow their companies through more rounds than their UK counterparts".[123] Dr Hopkins said that US companies can attract larger amounts of money. This means that:

> "Those companies, when they are well-capitalised, have many options. They can buy up other companies if their own projects run into problems. They can proceed swiftly with their research and development rather than having to look continuously for new funding."[124]

100. We sought to find out why UK life sciences firms encountered difficulties in accessing finance to enable them to grow.

101. A number of witnesses pointed to a lack of specialist investors within the UK who understood the life sciences sector. The BIA wrote:

> "Technology sectors need investors who understand what they are investing in and have the business skills to support a company throughout its growth … Increasing the pool of specialist investors would help increase the capital flow into the sector and support long-term sustainable growth."[125]

102. Sir Paul Nurse agreed that the UK lacked individuals who understood both science and finance. He said the situation was better in the USA where "I found there were real experts who understood the territory, who were in the investment industry and who had very close contact with academics … We need more of that".[126]

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120 Q 51 (Mike Thompson)
121 Written evidence from Babraham Research Campus (LSI0086)
122 Written evidence from MedCity (LSI0032)
123 Q 127 (Dr Andrew Elder)
124 Q 175 (Dr Michael Hopkins)
125 Written evidence from the BioIndustry Association (BIA) (LSI0017)
126 Q 62 (Sir Paul Nurse)

Improving access to funds for life sciences companies

103. In this section we consider suggestions made to improve the access of life sciences companies to funds to enable them to grow.

Patient Capital Review

104. In November 2016 the Prime Minister announced that HM Treasury would carry out a 'Patient Capital Review' to "strengthen the UK as a place where high-growth innovative firms can obtain the long-term 'patient' finance that they need to scale up". An independent panel of industry experts was convened by Sir Damian Buffini to support the review. The report of the independent panel was published in November 2017.[127]

105. The evidence we received prior to the publication of the Patient Capital Review expressed hope that it would represent a significant step forward in addressing the lack of capital flowing to Small and Medium Sized Enterprises (SMEs) in the UK life sciences sector.[128]

106. In August 2017, as part of the review, HM Treasury launched a consultation 'Financing growth in innovative firms'. The response to this consultation, which also responds to the recommendations of the independent panel, was published alongside the Budget on 22 November 2017.[129] A summary of the Government's response is in Box 2.

Box 2: Summary of proposed Government actions in response to the consultation 'Financing Growth in Innovative Firms'

Government's action plan to unlock over £20 billion to finance growth in innovative firms over 10 years by:

- Establishing a new £2.5 billion Investment Fund incubated in the British Business Bank;
- Significantly expanding the support that innovative knowledge-intensive companies can receive through the Enterprise Investment Scheme and Venture Capital Trusts;
- Investing in a series of private sector fund of funds of scale;
- Backing first-time and emerging fund managers through the British Business Bank's established Enterprise Capital Fund programme;
- Backing overseas investment in UK venture capital through the Department for International Trade;
- Launching a National Security Strategic Investment Fund of up to £85m.

127 Patient Capital Review Industry Panel, *Industry Panel Response* (22 November 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661397/PCR_Industry_panel_response.pdf [accessed 22 March 2018]

128 Written evidence from the Academy of Medical Sciences (LSI0107), University College London (LSI0058), ABPI (LSI0102), BIA (LSI0017), Q 58 (Sir Robert Lechler) and Q 129 (Dr Andrew Elder)

129 HM Treasury, *Financing growth in innovative firms: consultation response* (22 November 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661398/Patient_Capital_Review_Consultation_response_web.pdf [accessed 23 March 2018]

To support long-term investment:

- The Pensions Regulator will clarify guidance on how trustees can include investment in assets with long-term investment horizons, such as venture capital, infrastructure and other illiquid assets in a diverse portfolio. HM Treasury will establish a working group of institutional investors and fund managers to increase the supply of patient capital, including tackling continuing barriers holding back Defined Contribution pension savers from investing in illiquid assets.
- The Government will change the qualifying rules in Entrepreneurs' Relief to remove the disincentive to accept external investment and consulting on the detailed implementation of that change.
- The Government will carry out a feasibility study on a new guarantee programme modelled on the US 'Small Business Investment Company' programme.

Source: HM Treasury, Financing growth in innovative firms: consultation response (22 November 2017): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/661398/Patient_Capital_Review_Consultation_response_web.pdf [accessed 23 March 2018]

107. **The Government has responded positively to the Patient Capital Review and the subsequent consultation and its published action plan is a welcome contribution to raising R&D investment in the UK and creating the climate and the financial wherewithal for business growth.**

108. In response to the recommendations of the Review, HM Treasury said it planned to establish a working group of institutional investors and fund managers. They would examine how to increase the supply of patient capital, including by "tackling continuing barriers holding back defined contribution pension savers from investing in illiquid assets".[130] The Pension Regulator would also issue guidance on how trustees can include investment in assets with long-term investment horizons, such as venture capital, infrastructure and other illiquid assets in a diverse portfolio.

109. We heard that current rules which inhibit the trustees and managers of pension funds in the UK from investing a proportion of their assets in higher risk ventures—even when the investment horizon of such funds is 20–30 years—are a barrier to the flow of capital to innovative firms. Sir John Bell told us that the pensions industry itself was frustrated at being "limited to gilts and really low-return vehicles".[131] When the USA changed the 'prudent man rule'[132] in 1974, "a flood of venture capital into this sector occurred".[133] Dr John Bowler, portfolio manager for the Schroder global healthcare fund, agreed that this was an area where reform was needed.[134]

130 "Patient capital' plan could unlock pensions savings limits', *Financial Times* (24 November 2017): https://www.ft.com/content/0c48f8f6-d048-11e7-9dbb-291a884dd8c6 [accessed 22 March 2018]

131 Q 231 (Sir John Bell)

132 Under the Prudent Man Rule, when the governing trust instrument is silent concerning the types of investments permitted, the fiduciary is required to invest trust assets as a "prudent man" would invest his own property.

133 Q 198 (Sir John Bell)

134 Q 134 (Dr John Bowler)

110. With over £2tn in UK pension funds, even small changes in investment patterns have the potential to transform the supply of capital into innovative companies. For example, if, over time, 5% of the £2tn pension pot was allocated to the long-term growth of knowledge-intensive firms and if these firms put 5% of that investment into UK research, then 0.25% of the pension pot—a further £5bn—would be added to UK business R&D.[135]

111. **On the basis of the evidence we have received relating to the Patient Capital Review, relaxation of the rules on the allocation of pension fund assets to invest in patient capital projects could transform the availability of capital to the UK life sciences industry.**

112. ***HM Treasury's continuing engagement in the implementation and further development of the Industrial Strategy in general and its implications for the Life Sciences Industrial Strategy will be critical. This engagement will include not only promoting the availability of funds but also the establishment of a competitive fiscal environment. We recommend that the Treasury should report regularly to Parliament on progress.***

113. **We further conclude that the implementation of HM Treasury's response to the Patient Capital Review and the implementation of the Sector Deals, particularly in Life Sciences, needs to be co-ordinated to be effective. This might be achieved by the Patient Capital Review implementation team being represented on the Life Sciences Governing Body (see paragraph 49).**

114. ***The implementation of the Life Sciences Industrial Strategy and the Government's commitment to raise R&D investment to 2.4% of GDP by 2027 are closely intertwined. We recommend that the Government consults widely in the life sciences and other sectors before publishing plans to implement the 2.4% commitment and that the delivery plan for R&D investment is coordinated with the implementation plan for the Life Sciences Industrial Strategy.***

Tax environment

115. The tax system can be used to encourage investment in particular areas of the economy.

116. We heard praise for some aspects of the UK's tax environment. The ABPI pointed out that the UK's corporation tax rate is the lowest in the G20.[136] Steve Bates OBE, Chief Executive Officer of the BIA, told us, "the [UK] tax environment is very positive and creditable compared to other countries, particularly in R&D tax credits".[137]

117. The Seed Enterprise Investment Scheme (SEIS) and the Enterprise Investment Scheme (EIS) are venture capital schemes run by Her Majesty's Revenue and Customs. They aim to encourage investors to finance companies which they may otherwise view as too risky by offering tax breaks.

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135 'The government has promised more R&D. Where will the money come from?', *The Guardian* (4 January 2018): https://www.theguardian.com/science/political-science/2018/jan/04/the-government-has-promised-more-rd-where-will-the-money-come-from [accessed 13 April 2018]

136 Written evidence from the ABPI (LSI0102)

137 Q 51 (Steve Bates)

118. Dr Mark Hammond, co-founder of Deep Science Ventures, said SEIS had, "expanded what can be done in terms of the tech-based businesses"[138] but it did not translate to life sciences or hybrid science-based businesses because "the average angel …. They do not have the expertise on a specific life science sector. So they just avoid that altogether".[139]

119. However, some witnesses said that other aspects of the UK tax environment were not attractive to investors. The ABPI told us:

> "The UK only has a mid-table ranking in terms of Capital Allowances for investment in equipment, making it relatively less attractive to invest in pilot and full-scale manufacturing facilities in comparison to other countries."[140]

120. The BIA argued:

> "The inherent flaw in EIS and VCT [Venture Capital Trusts] schemes is that investors cannot follow their money in future non-qualifying fundraises. This penalises early investors as they become diluted as a company progresses."[141]

They suggested that continued tax relief for EIS and VCT investors when investing further in companies they have backed at an early stage and preferential access to further fundraises would, "incentivise greater and longer-term investing".[142]

121. The Government has placed a strong emphasis, both in the Industrial Strategy and in the Life Sciences Sector Deal, on raising total R&D investment in the UK to 2.4% of GDP by 2027. Much of the increase will come from business investment. Around half of the UK's existing business investment in R&D comes from companies headquartered overseas and there is potential to further increase foreign direct investment in R&D as a contribution to the 2.4% target through tax incentives.

122. The APG recommended that the Government should introduce measures to increase investment in R&D as part of a holistic approach to building a strong life sciences ecosystem which enables swift identification, access and uptake of innovative new medicines. They told us that, "this approach should also include measures to improve fiscal incentives for private sector investment in R&D, with the focus in the LSIS on incentives for manufacturing, tax and start-ups".[143]

123. **We welcome the Government's commitment to raising R&D investment in the UK to 2.4% of GDP by 2027and the emphasis it has been given. We look forward to the Government's plan for delivering the increase.**

138 Q 128 (Dr Mark Hammond)
139 *Ibid.*
140 Written evidence from the ABPI (LSI0102)
141 Written evidence from the BIA (LSI0017)
142 *Ibid.*
143 Written evidence from the American Pharmaceutical Group (APG) (LSI0110)

124. ***We recommend that the Government should review ways to increase further the attractiveness of the UK as a location for business investment in R&D, not least in the life sciences. We recommend that the review should include benchmarking of UK tax incentives against those in other research-intensive nations. We also recommend that the review should develop proposals for close cooperation between UK Research and Innovation, the Department for International Trade and the Department for Business, Energy and Industrial Strategy in attracting higher levels of foreign direct investment in R&D.***

Convergent training

125. A number of witnesses suggested that greater availability of convergent training—where individuals were knowledgeable about or had qualifications in both science and business—would aid the flow of capital to innovative UK firms. Firms in the UK will be at a disadvantage if their overseas competitors have better access to people with convergent skills.

126. Professor Chris Lowe OBE, Director of the Cambridge Academy of Therapeutic Sciences at the University of Cambridge, emphasised the importance of entrepreneurship, "if you are going to generate a lot of new ideas which will eventually feed through to a large multinational industry, you need the entrepreneurs to set that up and get it running. It is a matter of culture".[144]

127. Bristol BioDesign Institute told us that "entrepreneurship training" was a skills gap within the life sciences sector.[145] Sir John Bell told us, "the US has been very good at convergent training, in a sense, where people will get a science degree, then get an MBA, then go out into industry".[146] His strategy stated:

> "There should be support for entrepreneur training at all levels, incentivising varied careers and migration of academic scientists into industry and back to academia to increase influx of talented scientists and entrepreneurs in the public and private sectors."[147]

128. Birmingham Health Partners similarly suggested that:

> "Better and more relevant postgraduate training and courses are required alongside greater training through other education routes to develop a broad workforce that spans discovery science to adoption. … Training needs to cover a broad range of skills including commercial skills."[148]

129. The British Society for Immunology recommended that more opportunities for training in business development skills should be offered, which would take academics "out of their comfort zones and … instil a more entrepreneurial mind-set. Indeed, these opportunities could be integrated into undergraduate degree programmes to help blend commercial acumen into the training of the next generation of scientists".[149] Professor Tony Young, National Clinical

144 Q 10 (Prof Chris Lowe OBE)
145 Written evidence from the Bristol BioDesign Institute (LSI0027)
146 Q 232 (Sir John Bell)
147 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 64
148 Written evidence from Birmingham Health Partners (LSI0034)
149 Written evidence from the British Society for Immunology (LSI0072)

Director, Innovation at NHS England, told us that the UK had "the world's largest entrepreneurial training programme for clinicians from the National Health Service".[150]

130. Two representatives of SMEs from the life sciences sector who gave oral evidence to us did not agree that there was a gap between scientists and financial experts in the UK. Ian Staples, Chief Executive of Matoke Holdings Ltd said there was no gap at SME level and he and Mr Campbell agreed that part of their role was to bring people with those skills together.[151]

131. ***We recommend that the Government should review both the opportunities for training scientists and clinicians in business and entrepreneurial skills, and for encouraging members of the financial sector to develop sufficient understanding of the basics of the science and technology in which they are investing their clients' money.***

150 Q 289 (Prof Tony Young)
151 Q 29 (Mark Campbell CBE, Ian Staples)

CHAPTER 5: SKILLS AND TRAINING

132. We were told repeatedly that the Life Sciences Industrial Strategy needs to be a long-term endeavour. We heard that an essential requirement for implementation was a workforce with the skills and agility to seize the economic and social opportunities and address the challenges in propelling the UK to the world-leading position envisaged by the Bell report and the Life Sciences Sector Deal.

133. The Bell report stated, "the ultimate success of the Life Sciences Industrial Strategy is closely tied to the ability to train and recruit the best possible workforce, equipped with a breadth of critical skills".[152]

134. Witnesses praised the emphasis given to skills in the Bell report. Sir Paul Nurse said that it recognised "the exceedingly important issue of skills, having appropriate skills, and the ability to recruit the very best from around the world".[153]

Access to international talent and skills

135. Many businesses in the life sciences sector rely on access to talent from around the world—from within and outside the EU. The PHG Foundation, a health policy think-tank, told us that, "without the capacity to attract international experts in the life sciences to live and work in the UK, whether in the commercial, third or academic sector, ambitions for a world class life sciences industry will inevitably be curtailed".[154]

Brexit uncertainty

136. Within the EU, workers benefit from freedom of movement, allowing them to reside and work freely in any member state. We heard that freedom of movement had "been a great advantage to the life sciences sector".[155] Brexit poses a potential barrier to the UK's access to talent from the EU and to the access that UK citizens have to professional development opportunities in other member states.

137. Dr Menelas Pangalos, Executive Vice President of Innovative Medicines and Early Development (IMED) at AstraZeneca, told us that he was:

> "Worried about the impact of Brexit on our employees … the fact that we have no idea what is going to happen is a real problem. We are starting to see people turn us down now in the UK because they do not know what the outcome will be for future employment."[156]

Sir Paul Nurse told us that the UK's "image is suffering terribly at this moment".[157] The BEIS Minister agreed that the UK's image "had suffered a bit as a result of Brexit", but said the UK was still able to "attract the people"[158] and that they will be welcomed.[159]

152 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 50
153 Q 60 (Sir Paul Nurse)
154 Written evidence from the PHG Foundation (LSI0048)
155 Written evidence from Merck (LSI0118)
156 Q 24 (Dr Menelas Pangalos)
157 Q 66 (Sir Paul Nurse)
158 Q 283 (Lord Henley)
159 *Ibid.*

138. Witnesses called for the Government urgently to reassure businesses and individuals that the UK would keep its "door open to talent"[160] after Brexit. Sir Robert Lechler said: "We need, as rapidly as the negotiations will allow, to give certainty to our current continental European academics and to those we are trying to recruit that they will absolutely be welcome, secure and safe and that it will not be more difficult".[161]

Access to global talent and immigration reform

139. The life sciences sector requires "unencumbered access to high quality talent".[162] Sir Paul Nurse said the current visa system for individuals coming to work in the UK from outside the EU was "expensive, tedious and put people off".[163] Dave Allen, Senior Vice President, Respiratory Disease R&D at GSK, said that it needed to be simple for talented individuals to come to work in the UK because otherwise the UK would not be able "to compete with countries that are prepared to make it much easier for people to move and thrive in those countries".[164] Merck said that it would welcome steps to ease "the administrative and cost burden of bringing non-EU workers to the UK".[165] Tier 2 visas are issued to skilled non-European workers including doctors and other healthcare staff, software developers and laboratory scientists. In December 2017, January 2018 and February 2018 the cap for tier 2 visas was hit for an "unprecedented"[166] three months in a row.

140. Currently, because of mutual recognition of qualifications, medical doctors from within the EU are not subject to the lengthy process to practise in the UK that medical doctors from the rest of the world must face. Sir John Bell said the General Medical Council made it:

> "Almost impossible to recruit the most talented, skilled clinician scientists from around the world into the UK. The paperwork that people have to complete is awesome … They wait years to get approval. If we are going into a world where we are on our own [post-Brexit], we had better sort that problem out, because it will completely stuff us."[167]

141. The BEIS Minister assured us that the Government wanted "to reduce red tape in hiring international researchers, members of established research teams and so on"[168] and that discussions with the Home Office on this issue would continue. He pointed out that the Government had already "doubled the number of visas that will be available under tier 1, which is for exceptional talent".[169] Whilst this is welcome, we heard that there were skills gap at many levels in the life sciences sector, not just at the exceptional talent level. We discuss this in paragraph 156 below.

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160 Written evidence from Merck (LSI0118)
161 Q 59 (Sir Robert Lechler)
162 Written evidence from APG (LSI0110)
163 Q 66 (Sir Paul Nurse)
164 Q 24 (Dave Allen)
165 Written evidence from Merck (LSI0118)
166 'UK hits visa cap on skilled workers for third month in row', *The Guardian* (18 February 2018): https://www.theguardian.com/uk-news/2018/feb/18/uk-hits-skilled-worker-visa-cap-third-month-home-office-refuses-applications [accessed 12 April 2018]
167 Q 236 (Sir John Bell)
168 Q 283 (Lord Henley)
169 *Ibid.*

142. The MSC and the AUKUH called for the Government to "adopt a strategy that welcomes international talent and facilitates long term settlement in the UK for research workers and their families".[170] Alzheimer's Research UK said that Brexit represented an opportunity to produce:

> "An immigration system that recognises the collaborative nature of science and supports the thriving research and innovation base in the UK … The system must be fair, transparent and efficient, and sufficiently flexible to allow for the UK's changing skills needs and research priorities in the years ahead."[171]

143. Following an earlier recommendation from this Committee[172] the Government introduced the Rutherford Fund[173] for the specific purpose of attracting highly talented researchers to the UK from around the world. This fund has a low profile in the Life Sciences Industrial Strategy.

144. ***The Government and UK Research and Innovation should promote and expand the Rutherford Fund, aligning its objectives with those of the Life Sciences Industrial Strategy where appropriate.***

145. ***Immigration policy is central to the continued success of the UK life sciences sector. Any inhibition of free movement arising from Brexit will add urgency to the case for reform. The Department for Business, Energy and Industrial Strategy should assess what is required in the way of scientific talent from overseas and work with the Home Office to ensure that immigration regulations can facilitate this. Furthermore, we recommend that the body responsible for implementing the Life Sciences Industrial Strategy should include senior representation from the Home Office so that immigration policy can be incorporated into implementation plans.***

Skills training in the UK

146. In the previous section we considered access to global talent. In this section we consider the evidence about skills gaps within the life sciences sector and action required to ensure that the sector has access to home grown talent and skills.

Schools

147. We heard that building a home-grown skilled workforce was a long-term endeavour that needed to start in primary schools. Medtronic said that Science, Technology, Engineering and Mathematics (STEM) subjects needed to be prioritised "from the beginning to the end of a pupil's time in education".[174] Imperial College London said the focus on STEM needed to begin in primary and secondary education "to increase the proportion of the population who go on to be equipped with the advanced skills needed

170 Written evidence from Medical Schools Council (MSC) and Association of UK University Hospitals (AUKUH) (LSI0081)
171 Written evidence from Alzheimer's Research UK (LSI0024)
172 Science and Technology Committee, *A time for boldness: EU membership and UK science after the referendum* (1st Report, Session 2016–17, HL Paper 85)
173 Department for Business, Energy & Industrial Strategy, Press release: '£100 million Rutherford Fund to attract best researchers to the UK', 4 July 2017: https://www.gov.uk/government/news/100-million-rutherford-fund-to-attract-best-researchers-to-the-uk [accessed on 23 March 2018]
174 Written evidence from Medtronic (LSI0039)

by industry".[175] Merck said there needed to be a partnership between the education system and industry to encourage more young people into careers in science.[176]

148. PHG Foundation pointed out that teachers with skills in STEM were "in critically short supply in secondary schools, and even rarer in primary schools".[177]

Universities

149. Witnesses made a number of suggestions for action that universities could take to increase the breadth and depth of the skills of life sciences students and researchers.

150. We heard that there were skills gaps in many areas relating to the life sciences sector including data science,[178] engineers qualified in good manufacturing practice,[179] computational science, data management, toxicology and pathology, oncology, translational science, epidemiology, health economics and genomics.[180]

151. In Chapter 4 we discussed the need for convergent training, whereby individuals understand both science and business. This should improve mutual understanding between the scientific and investment communities with a view to increasing the flow of capital into the sector. Dr Peter Hughes Healthcare Equity Analyst at AXA Framlington Biotech Fund, explained that the situation was different in the USA, where:

> "When we see initial public offerings or follow-on offerings coming to market … they are generally … undertaken by specialist investors, whereas in the UK quite often we will see generalist investors … there is a difference in the level of investor understanding and sophistication with regards to specific life sciences offering."[181]

152. In a similar vein we were told that universities should offer wider training in business, investment and entrepreneurship to undergraduates and those pursuing further research in the life sciences.

153. Loughborough University said universities had a responsibility to produce highly technically skilled individuals and to:

> "Develop their entrepreneurial abilities, train and guide [them] to consider intellectual property, understand financial models for commercialisation and interdisciplinary working as part of their holistic development."[182]

The Academy of Medical Sciences similarly noted that the academic sector would benefit from additional skills in "business, entrepreneurialism and management".[183]

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175 Written evidence from Imperial College London (LSI0112)
176 Written evidence from Merck (LSI0118)
177 Written evidence from PHG Foundation (LSI0048)
178 Q 18 (Prof Philip Nelson)
179 Written evidence from the ABHI (LSI0091)
180 Written evidence from AstraZeneca (LSI0117)
181 Q 127 (Dr Peter Hughes)
182 Written evidence from Loughborough University (LSI0033)
183 Written evidence from the Academy of Medical Sciences (LSI0107)

154. Professor John Atherton, Pro Vice-Chancellor and Dean of the Faculty of Medicine and Health Sciences at the University of Nottingham, acknowledged that the provision of such skills to medical school students had traditionally not been well-developed but universities were now concentrating on this area: "increasingly, in the taught part of PhD training programmes … innovation skills are being brought in and that is now finding its way, slightly slowly perhaps, into clinical academic training as well". [184] Professor Lowe told us about *a course he had run in* bioscience enterprise which equipped medical students with the skills needed to establish companies.[185]

155. Witnesses from industry told us that graduates often lacked the hands-on skill and experience of a laboratory environment. Merck called for a greater focus on the way in which "students' learning in the classroom relates to a career in science and technology".[186]

Technicians and apprenticeships

156. The UK's requirement for skilled workers for the life sciences sector is not limited to graduates or senior scientists. We heard that there was an urgent need for more technicians and apprentices in this sector.

157. On technical training, the Bell report recommends:

> "The Government should establish Institutes of Technology that would provide opportunity for technical training, particularly in digital and advanced manufacturing areas."[187]

158. On apprenticeships the Bell report recommends that the Government should:

> "Create an apprenticeship scheme that focuses on data sciences, as well as skills across the life sciences sector, and train an entirely new cadre of technologists, healthcare workers and scientists at the cutting-edge of digital health."[188]

159. Dr Paul Lewis, King's College London, said that employers believed that specialist manufacturing and laboratory technician roles are "best filled by specialist technicians (rather than by graduates)".[189] He said that the use of over-qualified, but under-skilled, graduates to fill technician roles was "problematic, both because graduates lack practical skills and also because they become dissatisfied with the work and pay associated with technician roles".[190]

160. The Royal Microscopical Society commented that funding technician level apprenticeships was a good aim but needed expanding and:

> "Careful thinking about a career path for these technicians is needed (for example, in universities, the numbers of technical support staff have been decreasing over the past 20 years), and if there are enough available formal training courses for them."[191]

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184 Q 12 (Prof John Atherton)
185 Q 12 (Prof Chris Lowe OBE)
186 Written evidence from Merck (LSI0118)
187 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 64
188 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 63
189 Written evidence from Dr Paul Lewis (LSI0007)
190 *Ibid.*
191 Written evidence from the Royal Microscopical Society (LSI0038)

161. The Royal Society of Biology recommended that technical education should be promoted and developed to provide:

> "Alternative routes to develop skills in the life sciences sector, including apprenticeships … which may provide alternative routes for people to enter higher education. Recognition and support for those following technical routes is important to encourage retention of individuals following this track."[192]

The Royal Society of Chemistry called for quality vocational education and apprenticeships across the life sciences sector.[193] The ABPI said that there needed to be greater flexibility associated with the development of new apprenticeship standards and employment of apprentices.[194]

162. The BEIS Minister said that the Government was aware of the need for action:

> "That is why in the Life Sciences Industrial Strategy we looked at a group of six recommendations on developing a reinforced skills action plan, creating a new apprenticeship scheme, focusing on data sciences and establishing Institutes of Technology that will provide opportunities for technical training and support for entrepreneur training at all levels. These all come straight from the Life Sciences Sector Deal and are what the Government should be pursuing: a fund being established to support convergent science activities and high-quality STEM education being provided for all."[195]

Conclusion and recommendations on a skilled workforce

163. ***We welcome Sir John Bell's recommendations on the need to deliver a skilled workforce for the life sciences sector. However, without a clear implementation plan the chances of action in this area, which requires cross-departmental coordination, seem slim. Progress will require the full cooperation of and support from the Department for Education. We therefore recommend that the membership of the Life Sciences Governing Body should include a senior representative from the Department for Education.***

164. ***While further education has an important role in developing the full range of skills, the further education sector has had a low profile in the Life Science Industrial Strategy and in ministerial announcements on the Industrial Strategy more widely. We welcome the Government's announcement of the establishment of new Institutes for Technology. Closer integration of further and higher education in the implementation of the Life Sciences Industrial Strategy would be welcome. We recommend that the Department for Business, Energy and Industrial Strategy and the Department for Education publish a joint statement on the relationship between higher and further education in the implementation of the strategy.***

192 Written evidence from the Royal Society of Biology (LSI0101)
193 Written evidence from the Royal Society of Chemistry (LSI0049)
194 Written evidence from the ABPI (LSI0102)
195 Q 283 (Lord Henley)

165. ***Incremental development and strengthening of further education will not provide the boost needed to address the skills challenges identified in evidence to this inquiry. We recommend that the Department for Education promote stronger and more varied relationships between the further education sector and the business community, for example by creating the further education equivalent of the widely praised Higher Education Innovation Fund that has done so much to enhance university-business relationships over the last decade.***

CHAPTER 6: SCIENTIFIC EXCELLENCE

166. Many witnesses highlighted the importance of maintaining the UK's excellent science base as part of the Life Sciences Industrial Strategy, not least because it attracted global corporations to invest in the UK. In this Chapter we make recommendations on how to maintain excellence in UK science.

Basic Science

167. The Government's Industrial Strategy provided a welcome emphasis on the economic value of high-quality scientific research. The actions arising from the strategy will focus on economic development. However, any long-term strategic view of the economy should protect and nurture science at the frontiers of knowledge—sometimes referred to as 'discovery science'.

168. The BIA told us that "maintaining the UK's world-leading science base … is essential to the UK's long-term attractiveness for life sciences investment".[196] A similar point was made by other witnesses.[197]

169. The Government has committed to increase investment in R&D to 2.4% of GDP by 2027 and to 3% in the longer term. Much of the immediate public-sector contribution to increased R&D investment (up to 2020/21) is through the Industrial Strategy Challenge Fund (ISCF). The focus of the ISCF is mainly on applied research and innovation within specific 'challenges' that have been identified by the Government. While this increase in funding is welcome, Sir Robert Lechler told us that in order to maintain the excellence of the UK science base it is important to maintain a balance between research funding for discovery and applied science. He saw "a risk that discovery science may be disadvantaged if we are not careful in the current climate".[198]

170. AstraZeneca told us that the 2.4% target was lower and would be achieved more slowly than the sector would like to see.[199] This point was echoed by Dr Mark Downs, Chief Executive of the Royal Society of Biology.[200] The Bell report calls for the UK to be in the top quartile of OECD countries on R&D spending, which would equate to 2.6% of GDP.[201]

UK Research and Innovation

171. UK Research and Innovation (UKRI) came into existence in April 2018 and has an important role to play in the implementation of the Life Sciences Industrial Strategy and the Industrial Strategy more widely. UKRI brings the seven research councils, the research arm of the Higher Education Funding Council for England (HEFCE) and Innovate UK under the umbrella of one public body. That will, in principle, allow better co-ordination of resources and provide a single voice to Government for science and innovation.

196 Written evidence from the BIA (LSI0017)
197 Written evidence from Lilly UK (LSI0106), Q 22 (Dave Allen) and Q 188 (Louise Houson)
198 Q 54 (Sir Robert Lechler)
199 Written evidence from AstraZeneca (LSI0117)
200 Q 267 (Dr Mark Downs)
201 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*, p 21

172. The creation of UKRI opens further opportunities to fund research and innovation programmes that combine established fields of life sciences with, for example, mathematics, engineering and social sciences. Professor Paul Kellam from the Microbiology Society told us that:

> "It is the cross-fertilisation between disciplines within the biomedical arena that leads to innovation … this is a coming together of three or four strands of technology, from computer science, genomics, infectious disease and ecology."[202]

173. The White Paper says that the Government will work with UKRI to develop a new competitive 'Strategic Priorities Fund', which builds on the vision of a common fund as set out in Sir Paul Nurse's review of research councils.[203] The White Paper states that this fund "will support high quality R&D priorities which would otherwise be missed—multidisciplinary and inter-disciplinary programmes identified by researchers and businesses at the cutting edge of research and innovation".[204] Professor Sir Mark Walport, chief executive of UKRI, told us that:

> "Part of our job in UK Research and Innovation is to catalyse the research and innovation community to answer the sorts of questions that might not be answered simply by a programme grant or a fellowship programme. It is about how we stimulate the imagination of the community to come up with the big and important questions."[205]

Place

174. The White paper contains five "foundations of productivity" one of which is "places—to have prosperous communities across the UK". The White Paper says that the UK has greater disparities in regional productivity than other European countries.[206] We heard a range of views on the distribution of the life sciences sector and the availability of investment and public funding across the UK.

175. Sir John Bell told us that there is "a very dense aggregation of the high-tech sector in the south east, co-located with the major universities", often called the 'golden triangle', with Oxford, Cambridge and London as its three corners. However, as he looked around the country he "became much more relaxed that we did not, in life sciences, have this issue of place".[207] He thought that the sector looked different in different parts of the country and, therefore, the whole country is never going to look like the golden triangle. The BEIS Minister told us that he did not think there was an over-concentration of the sector in the south east.[208] The Health Minister said "22% [of the sector] is in the south-east of England but 21% is in the north of England".[209]

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202 Q 265 (Prof Paul Kellam)
203 Sir Paul Nurse, *Ensuring a successful UK research endeavour: A review of the UK research councils* (19 November 2015): https://www.gov.uk/government/publications/nurse-review-of-research-councils-recommendations [accessed 13 April 2018]
204 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*
205 Q 246 (Sir Mark Walport)
206 HM Government, *Industrial Strategy: Building a Britain fit for the future*, Cm 9528, 27 November 2017, p 214: https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future [accessed 23 March 2018]
207 Q 208 (Sir John Bell)
208 Q 282 (Lord Henley)
209 Q 282 (Lord O'Shaughnessy)

176. Others were concerned that there was too much focus on the golden triangle. The University of Nottingham told us that "geographic distribution of life science investment in the UK is a particular issue. Research infrastructure is good in the Golden Triangle but as a country we need to ensure all regions have access to funding and facilities".[210] Queens University Belfast told us that "access to investment funding is sub-optimum, especially outside the 'golden triangle'. This is a particular issue for devolved regions such as Northern Ireland".[211] The Life Sciences Scotland Industry Leadership Group told us that "investment for life sciences is seen as high risk and available funding in the UK is centred around the golden triangle in the south-east".[212]

177. Louise Houson, UK Managing Director of US-based MSD, who recently announced a new research centre to be based in London, told us that this decision "was based on our ability to get access to the best scientific talent. … this is a really good place at the moment to do early discovery-stage science … we believe that this is where the best science is".[213] AstraZeneca, who have also recently moved a large amount of R&D activity to Cambridge from the north-west, said that the UK should "play to our science strengths by developing clusters of global excellence in research (such as the golden triangle)".[214]

178. **Increasing investment in the regions of the UK should not be at the expense of the golden triangle; the concentration of excellence in the south-east attracts private-sector investment. Such investment is essential to the Government's commitment to raise R&D levels to 2.4% of GDP by 2027.**

Clusters

179. The Bell report says that geographical clustering of companies alongside their supply chain can bring additional economic benefits. Dr Glenn Crocker MBE, representing the UK Science Park Association, told us that this was because "they tend to spark off each other and you get collaborations. You get lots of communication between them. Then the sector grows and grows".[215] Professor Stirling said, "one cannot stress too much the importance of the geographical co-location of scientists from industry, from academia and from the health sector … proximity is so important in this".[216] MedCity, themselves a cluster organisation, told us that cluster organisations can "help make an impact through their ability to bring their networks together and mobilise initiatives".[217]

180. The Bell report describes the golden triangle as an example of a cluster. For other witnesses clusters are smaller in scope—for example the Cambridge life sciences cluster. Clusters are almost always based around a university or other research institute. The Bell report states that governments cannot create clusters but they can support their growth by providing the necessary infrastructure and access to funding for research.[218] The Health Minister

210 Written evidence from the University of Nottingham (LSI0067)
211 Written evidence from Queen's University Belfast (LSI0083)
212 Written evidence from the Life Sciences Scotland Industry Leadership Group (LSI0042)
213 Q 188 (Louise Houson)
214 Written evidence from AstraZeneca (LSI0117)
215 Q 137 (Dr Glenn Crocker MBE)
216 Q 12 (Prof James Stirling CBE)
217 Written evidence from MedCity (LSI0032)
218 Sir John Bell, *Life Sciences Industrial Strategy—A report to the Government from the life sciences sector*

told us that the Government will not "try to force a specialism on areas that do not have one just for the sake of spreading them out, but to try to build on expertise that exists".[219] The Foreign and Commonwealth Office told us that Germany, at both federal and state level, has strongly supported cluster growth in recent years. At a federal level this had been through open competition for funding.[220]

181. Clusters can involve parts of the NHS—for example, large teaching hospitals. The Shelford group, which represents 10 English academic healthcare organisations, told us that "incentivising leading NHS organisations to work together with universities and industry as innovation hubs/clusters" can help create "local and national engines of economic growth".[221]

182. ***We recommend that UK Research and Innovation should include in its published strategy a commitment to maintaining the UK's position as one of the world top three nations in scientific discovery in the life sciences sector.***

183. ***We support the Government's efforts to improve the geographical spread of excellent research throughout the UK. Clusters containing universities, teaching hospitals, and companies large and small can help drive the success of the life sciences sector. The Government should identify clusters of excellence and encourage their growth.***

Innovation and Catapults

184. Catapults are designed to "support innovative businesses by providing access to the critical facilities and expertise they would not find together elsewhere" and to enable "SMEs to access the support needed to bring products and services to market for the first time". There are a number of catapults that operate in the life sciences sector: the Cell and Gene Therapy Catapult, the High Value Manufacturing Catapult and the recently established Medicines Discovery Catapult. Innovate UK is responsible for oversight of the network of catapults.

185. The Royal Academy of Engineering told us that Catapults "play an important role supporting innovations to bridge the gap from R&D to commercialisation". The Government said that Catapults "play a key role in supporting the innovation landscape".[222] However, aside from Catapults themselves and Innovate UK, few of our witnesses mentioned Catapults as a way of improving the commercialisation of research and growing new spin-out companies.

186. An independent EY review of catapults was commissioned and published by the Government. It found that "the concept of Catapults is sound and, when effectively implemented, Catapults have the potential to drive innovation and economic benefit to the UK".[223] Dr Ruth McKernan CBE, Chief Executive of Innovate UK, told us that Innovate UK will take on board the EY review and will make "some changes and modifications".[224] Sir Mark Walport said it will be the job of UKRI to implement the findings of the report.[225]

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219 Q 282 (Lord O'Shaughnessy)
220 Written evidence from HM Government (LSI0121)
221 Written evidence from the Shelford Group (LSI0103)
222 Written evidence from the Royal Academy of Engineering (LSI0096)
223 EY, *Catapult Network Review* (17 November 2017), p 12: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/662509/Catapult_Review_-_Publishable_Version_of_EY_Report__1_.pdf [accessed 12 April 2018]
224 Q 93 (Dr Ruth McKernan CBE)
225 Q 250 (Sir Mark Walport)

187. ***We recommend that the Government implements in full the recommendations of the EY review of Catapults that are relevant to the Life Sciences.***

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Challenges of implementation

1. We recommend that the Government should identify and publish the areas of life sciences not covered by the Bell report and the Life Sciences Sector Deal. Businesses and investors in parts of the life sciences not covered will then know the areas in which they are free to propose further sector deals. (Paragraph 16)

2. There is some ambiguity about the status of the Bell report and its implementation. We recommend that the Government should adopt the Bell report in full and provide an implementation plan to which it and the other stakeholders can be held to account. (Paragraph 18)

3. The evidence we have heard, particularly about the failings of the 2011 Life Sciences Strategy, has highlighted the importance of a detailed implementation plan that contains timelines, milestones and metrics for measuring success. The Bell report provides the vision for the sector; the Government must now work with stakeholders to draw up an implementation plan. (Paragraph 22)

4. The Government remains focused on a transactional relationship with rather than a strategic partnership with the life sciences sector. This is inadequate. (Paragraph 26)

5. The first phase of the Life Sciences Sector Deal as published does not constitute a plan that will ensure the successful implementation of the Bell report. The Sector Deal is designed along the lines of those for other sectors. It does not take account of the important and central role of the NHS which necessitates greater Government involvement in the life sciences sector. (Paragraph 30)

6. We are disappointed that the Sector Deal does not contain the metrics, governance and oversight arrangements that the Government had promised in its written evidence. It lacks operational detail on how different arms of the Government will work together towards a single objective. Furthermore, it does not provide information about the provision and allocation of resources for many strands of implementation (particularly those involving the NHS). (Paragraph 31)

7. As a minimum, the Government must clarify urgently:

    - Which bodies are responsible for each aspect of operational delivery of implementation;
    - The membership of these bodies;
    - Their terms of reference; and
    - The authority these bodies will have to coordinate policy and delivery across Government departments.

8. In paragraph 49 we set out our proposals for the implementation of the strategy which go beyond the minimum standards set out above. (Paragraph 34)

9. The Government should propose and obtain agreement from all stakeholders to an implementation plan for the Bell report and the Life Sciences Sector Deal, which must be integrated with the implementation of the overall Industrial Strategy. (Paragraph 37)

10. The Government must clarify exactly which documents comprise the Life Sciences Industrial Strategy. This is still unclear and successful implementation cannot be achieved until it is clarified. Most witnesses told us that they understand the strategy to be the Bell report and the Life Sciences Sector Deal and we have adopted that definition. (Paragraph 46)

11. Implementation and oversight are vital to the success of both the Life Sciences Industrial Strategy and the wider Industrial Strategy. The Government's plans for implementation and oversight do not provide an effective model and as set out are a recipe for failure. Not only do they lack clarity and detail, they fail adequately to take account of the central role of the NHS in the life sciences sector. (Paragraph 47)

12. In the following paragraphs we set out our proposal for delivery, accountability and leadership which, drawing on the Government's model and suggestions made to us by witnesses, sets out a clear and effective system for implementing the Life Sciences Industrial Strategy. See also Figure 1, which shows our proposal in the form of a diagram. (Paragraph 48)

13. The Government's system for implementation is too complex and duplicative. We recommend that, in place of the Life Sciences Implementation Board and the Life Sciences Council, there should be a single body (referred to hereafter as the Life Sciences Governing Body) responsible for the delivery of the Life Sciences Industrial Strategy, which should:

    - Be co-chaired by the Secretary of State for Business, Energy and Industrial Strategy and the Secretary of State for Health and Social Care with executive leadership from Sir John Bell as Life Sciences Champion;
    - Meet frequently;
    - Have a membership of about 12, including senior figures from the NHS, industry, academia and the charities sector;
    - Take the lead in drawing up an implementation plan, with clear milestones, timelines and criteria for success;
    - Task subordinate working groups with the actual operational delivery of specific areas of the plan; and
    - Report to a Cabinet Committee. (Paragraph 49)

14. The Secretaries of State for Business, Energy and Industrial Strategy and Health and Social Care should ensure the Life Sciences Governing Body has the backing required to do its work and should take responsibility for the cross-Government aspects of the strategy. (Paragraph 50)

15. We recommend the creation of a new statutory body, the Office for Industrial Strategy (OfIS) with the authority to scrutinise the implementation of the wider Industrial Strategy and the Life Sciences Industrial Strategy and to publish its findings. The remit of the OfIS should cover the implementation of the Patient Capital Review. The OfIS would be accountable to Parliament and report annually on progress made by each Government department in implementing the Industrial Strategy. (Paragraph 51)

Role of the NHS

16. The current structure of the NHS stifles innovation. A focus on cost-control and a lack of co-ordination between the various bodies that make up the NHS means that the adoption and spread of innovations is not given the priority it requires. Unless the NHS's ability to adopt and spread innovations is improved, it will not be able to play a full role in the implementation of the Life Sciences Industrial Strategy. This will endanger the success of the strategy. (Paragraph 61)

17. NHS England and NHS Improvement must give the highest priority to the adoption and spread of innovation throughout the NHS. They should work together to align their strategies to maximise the chances of success in this area. (Paragraph 62)

18. The NHS should give greater priority to the uptake and spread of innovation and to rewarding clinicians and managers who make such adoption successful. We recommend that the Government should explore how it can offer financial incentives to those NHS trusts that adopt and spread proven innovations. (Paragraph 71)

19. The Academic Health Science Networks have a role to play in driving the adoption at pace and scale of innovations throughout the NHS. Where they are working well AHSNs should be further developed. AHSNs should have a clear link to the Life Sciences Governing Body (see paragraph 49). (Paragraph 72)

20. We recommend that NHS England should mandate the uptake of those innovations that have been shown to improve patient outcomes and provide good value for money. (Paragraph 73)

21. The problems standing in the way of exploitation of NHS healthcare data for the benefit of patients and the wider economy were explained to us by many witnesses. We did not, however, receive commensurate evidence about the possible solutions to them. This is probably in part because the focus of our inquiry was on the Life Sciences Industrial Strategy rather than the NHS. The Government has set out some early, welcome steps in the Life Sciences Sector Deal, including the establishment of Digital Innovation Hubs which we hope will go some way to tackling this. (Paragraph 82)

22. We recommend that the Government should develop solutions to the following problems associated with exploiting NHS patient data:

    - collection of data in a usable, standardised format across the NHS;
    - the ability to link different systems across the NHS;
    - access to NHS data by third parties and rules for commercial exploitation; and the
    - public acceptance of and trust in the use of healthcare data for patient benefit and research.

23. These solutions might include financial incentives for Trusts, a role for AHSNs in setting up Digital Innovation Hubs as described in the Life Sciences Sector Deal, a sustained and substantial public engagement campaign and the involvement of the proposed Centre for Data Ethics and Innovation. (Paragraph 83)

24. While we welcome the ambition that lies behind the HARP proposal, we find the analogy to DARPA in the USA misleading. HARP will not have the scale or context of DARPA and should be conceived around the opportunities and needs of the UK. The Government must also clarify the sources and scale of funding for HARP. (Paragraph 87)

Finance and commercialisation

25. The ability of research universities in the UK to attract global R&D investors to this country should make a significant contribution to the Government's commitment to raise R&D investment to 2.4% of GDP by 2027. It is a further reason—if one is needed—to support the very best basic science in the UK. (Paragraph 91)

26. Without endorsing the specific targets that the Bell report sets, we agree that the UK's historic poor performance in this area is a concern because real economic value comes not from funding start-ups but from enabling scale-up. (Paragraph 96)

27. The Government has responded positively to the Patient Capital Review and the subsequent consultation and its published action plan is a welcome contribution to raising R&D investment in the UK and creating the climate and the financial wherewithal for business growth. (Paragraph 107)

28. On the basis of the evidence we have received relating to the Patient Capital Review, relaxation of the rules on the allocation of pension fund assets to invest in patient capital projects could transform the availability of capital to the UK life sciences industry. (Paragraph 111)

29. HM Treasury's continuing engagement in the implementation and further development of the Industrial Strategy in general and its implications for the Life Sciences Industrial Strategy will be critical. This engagement will include not only promoting the availability of funds but also the establishment of a competitive fiscal environment. We recommend that the Treasury should report regularly to Parliament on progress. (Paragraph 112)

30. We further conclude that the implementation of HM Treasury's response to the Patient Capital Review and the implementation of the Sector Deals, particularly in Life Sciences, needs to be co-ordinated to be effective. This might be achieved by the Patient Capital Review implementation team being represented on the Life Sciences Governing Body (see paragraph 49). (Paragraph 113)

31. The implementation of the Life Sciences Industrial Strategy and the Government's commitment to raise R&D investment to 2.4% of GDP by 2027 are closely intertwined. We recommend that the Government consults widely in the life sciences and other sectors before publishing plans to implement the 2.4% commitment and that the delivery plan for R&D investment is coordinated with the implementation plan for the Life Sciences Industrial Strategy. (Paragraph 114)

32. We welcome the Government's commitment to raising R&D investment in the UK to 2.4% of GDP by 2027and the emphasis it has been given. We look forward to the Government's plan for delivering the increase. (Paragraph 123)

33. We recommend that the Government should review ways to increase further the attractiveness of the UK as a location for business investment in R&D, not least in the life sciences. We recommend that the review should include benchmarking of UK tax incentives against those in other research-intensive nations. We also recommend that the review should develop proposals for close cooperation between UK Research and Innovation, the Department for International Trade and the Department for Business, Energy and Industrial Strategy in attracting higher levels of foreign direct investment in R&D. (Paragraph 124)

34. We recommend that the Government should review both the opportunities for training scientists and clinicians in business and entrepreneurial skills, and for encouraging members of the financial sector to develop sufficient understanding of the basics of the science and technology in which they are investing their clients' money. (Paragraph 131)

Skills and training

35. The Government and UK Research and Innovation should promote and expand the Rutherford Fund, aligning its objectives with those of the Life Sciences Industrial Strategy where appropriate. (Paragraph 144)

36. Immigration policy is central to the continued success of the UK life sciences sector. Any inhibition of free movement arising from Brexit will add urgency to the case for reform. The Department for Business, Energy and Industrial Strategy should assess what is required in the way of scientific talent from overseas and work with the Home Office to ensure that immigration regulations can facilitate this. Furthermore, we recommend that the body responsible for implementing the Life Sciences Industrial Strategy should include senior representation from the Home Office so that immigration policy can be incorporated into implementation plans. (Paragraph 145)

37. We welcome Sir John Bell's recommendations on the need to deliver a skilled workforce for the life sciences sector. However, without a clear implementation plan the chances of action in this area, which requires cross-departmental coordination, seem slim. Progress will require the full cooperation of and support from the Department for Education. We therefore recommend that the membership of the Life Sciences Governing Body should include a senior representative from the Department for Education. (Paragraph 163)

38. While further education has an important role in developing the full range of skills, the further education sector has had a low profile in the Life Science Industrial Strategy and in ministerial announcements on the Industrial Strategy more widely. We welcome the Government's announcement of the establishment of new Institutes for Technology. Closer integration of further and higher education in the implementation of the Life Sciences Industrial Strategy would be welcome. We recommend that the Department for Business, Energy and Industrial Strategy and the Department for Education publish a joint statement on the relationship between higher and further education in the implementation of the strategy. (Paragraph 164)

39. Incremental development and strengthening of further education will not provide the boost needed to address the skills challenges identified in evidence to this inquiry. We recommend that the Department for Education promote stronger and more varied relationships between the further education sector and the business community, for example by creating the further education equivalent of the widely praised Higher Education Innovation Fund that has done so much to enhance university-business relationships over the last decade. (Paragraph 165)

Scientific excellence

40. Increasing investment in the regions of the UK should not be at the expense of the golden triangle; the concentration of excellence in the south-east attracts private-sector investment. Such investment is essential to the Government's commitment to raise R&D levels to 2.4% of GDP by 2027. (Paragraph 178)

41. We recommend that UK Research and Innovation should include in its published strategy a commitment to maintaining the UK's position as one of the world top three nations in scientific discovery in the life sciences sector. (Paragraph 182)

42. We support the Government's efforts to improve the geographical spread of excellent research throughout the UK. Clusters containing universities, teaching hospitals, and companies large and small can help drive the success of the life sciences sector. The Government should identify clusters of excellence and encourage their growth. (Paragraph 183)

43. We recommend that the Government implements in full the recommendations of the EY review of Catapults that are relevant to the Life Sciences. (Paragraph 187)

APPENDIX 1: LIST OF MEMBERS AND DECLARATIONS OF INTEREST

Members

Lord Borwick
Lord Fox
Lord Griffiths of Fforestfach
Lord Hunt of Chesterton
Lord Kakkar
Lord Mair
Lord Maxton
Baroness Morgan of Huyton
Baroness Neville-Jones
Lord Oxburgh
Lord Patel (Chairman)
Lord Renfrew of Kaimsthorn
Lord Vallance of Tummel
Baroness Young of Old Scone

Declarations of interest

Lord Borwick

No relevant interests declared

Lord Fox

Has done work for the consultancy Telos Partners LLP
Does consultancy work and has a financial interest in GKN PLC
Financial interest in Smiths Group PLC
Liberal Democrat Lords Spokesperson (Business, Energy and Industrial Strategy)

Lord Griffiths of Fforestfach

Director, Goldman Sachs International
Director, Goldman Sachs International Bank

Lord Hunt of Chesterton

Director CERC Ltd
Consultant Tokamak Energy Ltd
Fellow, Royal Society
Consultant Atlas Elektonik

Lord Kakkar

Professor of Surgery, University College London (UCL)
Active in biomedical research
Chair, UCL Partners (Academic Health Science Centre and Network)
Director, Thrombosis Research Institute
UK Business Ambassador for Healthcare and Life Sciences

Lord Mair

Fellow, Royal Academy of Engineering
Fellow, Royal Society
Emeritus Professor of Civil Engineering, Director of Research, Cambridge University

Lord Maxton

No relevant interests declared

Baroness Morgan of Huyton

Vice-Chair of Council, King's College, University of London
Chair, Royal Brompton & Harefield NHS Foundation Trust

Baroness Neville-Jones

Member, Engineering and Physical Sciences Research Council
Trustee, Cyclotron Trust

Lord Oxburgh

No relevant interests declared

Lord Patel

Chancellor, University of Dundee
Professor of Obstetrics, University of Dundee
Fellow, Royal Society of Edinburgh
Fellow, Academy of Medical Sciences
Member, Advisory Council, Vopulus

Lord Renfrew of Kaimsthorn

Fellow, British Academy
Fellow, Royal Society of Edinburgh
Foreign Associate of the National Academy of Sciences of the USA

Lord Vallance of Tummel

Chairman, Edinburgh Business School

Baroness Young of Old Scone

Health Service Management posts 1971–90
Founder Chairman of the Care Quality Commission 2008–10
Former Chief Executive, Diabetes UK 2010–15
Trustee, St Mary's Hospital Development Trust 2005–present day
Chancellor for Cranfield University 2010–present day

A full list of Members' interests can be found in the Register of Lords Interests: http://www.parliament.uk/mps-lords-and-offices/standards-and-interests/register-of-lords-interests/

Specialist Adviser

Professor Graeme Reid, Chair of Science and Research Policy, University College London

Professor of Science and Research Policy, University College London
Member of the Council of Research England
Strategic Advisor to the National Centre for Universities and Business
Chairman of the Board of Directors, Campaign for Science and Engineering
Trustee, Association of Medical Research Charities
Associate Fellow, Centre for Science and Policy, University of Cambridge
Fellow, the Institute of Physics
Fellow, the Institution of Engineering and Technology
Leading a review of research and innovation for the Welsh Government

APPENDIX 2: LIST OF WITNESSES

Evidence is published online at http://www.parliament.uk/life-sciences-industrial-strategy and available for inspection at the Parliamentary Archives (020 7219 3074).

Evidence received by the Committee is listed below in chronological order of oral evidence session and in alphabetical order. Those witnesses marked with ** gave both oral evidence and written evidence. Those marked with * gave oral evidence and did not submit any written evidence. All other witnesses submitted written evidence only.

Oral evidence in chronological order

*	Dr Annette Bramley, Head of Healthcare Technologies, Engineering and Physical Sciences Research Council (EPSRC)	QQ 1–8
*	Sir John Savill, Chief Executive, Medical Research Council (MRC)	
*	Louise Wren, Policy Adviser, Wellcome Trust	
**	Sir Harpal Kumar, Chief Executive Officer, Cancer Research UK	
**	Professor Chris Lowe OBE, Emeritus Professor and Director of the Cambridge Academy of Therapeutic Sciences, Cambridge University	QQ 9–14
**	Professor John Atherton, Pro Vice-Chancellor and Dean of the Faculty of Medicine and Health Sciences, University of Nottingham	
**	Professor David Price, Vice-Provost (Research), University College London	
*	Professor James Stirling CBE, Provost, Imperial College London	
**	Professor Philip Nelson, Chair, Research Councils UK (RCUK)	QQ 15–21
**	Dave Allen, Senior Vice President, Respiratory Disease R&D, GSK	QQ 22–26
**	Dr Menelas Pangalos, Executive Vice President of Innovative Medicines and Early Development (IMED) Biotech Unit, AstraZeneca	
**	Mark Campbell CBE, Senior Manager, Randox Laboratories Ltd	QQ 27–31
**	Ian Staples, Chief Executive, Matoke Holdings Ltd	
**	Bryn Sage, Chief Executive, Inhealthcare Ltd	
*	Dr Ian Hudson, Chief Executive, Medicines and Healthcare Regulatory Agency (MHRA)	QQ 32–38
**	Sir Andrew Dillon, Chief Executive, National Institute for Health and Care Excellence (NICE)	

*	Keith Chantler, Director of Innovation, Manchester University NHS Foundation Trust	QQ 39–45
*	Dame Julie Moore, Chief Executive, University Hospitals Birmingham NHS Foundation Trust	
*	Professor Bryan Williams, Director of R&D, University College London Hospitals	
**	Mike Thompson, Chief Executive Officer, Association of the British Pharmaceutical Industry (ABPI)	QQ 46–53
**	Nisha Tailor, Head of Policy and Public Affairs, Association of Medical Research Charities (AMRC)	
**	Steve Bates OBE, Chief Executive Officer, BioIndustry Association	
**	Professor Sir Robert Lechler, President, Academy of Medical Sciences	QQ 54–59
**	Professor Joyce Tait, Director of the Innogen Institute at the University of Edinburgh, Royal Society of Edinburgh	
*	Professor Mark Tooley, President of the Institute of Physics and Engineering in Medicine, Fellow of Royal Academy of Engineering	
**	Sir Paul Nurse, Director and Chief Executive, Francis Crick Institute	QQ 60–68
**	Dr Veronique Birault, Head of Translation, Francis Crick Institute	QQ 69–77
**	Dr Simon Boulton, Senior Group Leader, Francis Crick Institute	
**	Professor Charles Swanton, Senior Group Leader, Francis Crick Institute	
**	Dr Kathy Niakan, Group Leader, Francis Crick Institute	
**	Dr Caetano Reis e Sousa, Senior Group Leader, Francis Crick Institute	
**	Dr Ruth McKernan CBE, Chief Executive Officer, Innovate UK	QQ 78–93
**	Chris Molloy, Chief Executive Officer, Medicines Discovery Catapult	
**	Keith Thompson, Chief Executive Officer, Cell and Gene Therapy Catapult	
**	Professor Graham Hillier, Strategy and Futures Director, Centre for Process Innovation, High Value Manufacturing Catapult	
**	Ian Dodge, National Director for Strategy and Innovation, NHS England	QQ 94–109
*	Professor Keith McNeil, Chief Clinical Information Officer Health and Social Care, NHS England	

**	Professor Mike Hannay, Managing Director of the East Midlands Academic Health Science Network (AHSN), NHS England	
*	Professor Jonathan Elliott, Vice-Principal, Research and Innovation, Royal Veterinary College	QQ 110–126
**	Dr David Hughes, Head of Global R&D Technology Scouting, Syngenta	
**	Professor Angela Karp, Director for Science Innovation, Engagement and Partnerships, Rothamsted Research	
**	Dr Mark Hammond, Co-founder, Deep Science Ventures	QQ 127–134
*	Dr John Bowler, Fund Manager and Global Sector Specialist with responsibility for the health care sector, Schroders PLC	
*	Dr Peter Hughes, Healthcare Equity Analyst, AXA Framlington Biotech Fund	
*	Dr Andrew Elder, Partner, Albion Capital	
*	Dr Glenn Crocker MBE, Representative of the UK Science Park Association (UKSPA) and Chief Executive of BioCity Nottingham Ltd	QQ 135–142
*	Dr Iain Thomas, Head of Life Sciences, Cambridge Enterprise	
*	Dr Sally Ann Forsyth, Chief Executive Officer, Norwich Research Park	
*	The Rt Hon the Lord Heseltine CH	QQ 143–152
*	Sir John Chisholm, Executive Chair, Genomics England	QQ 153–159
**	Professor Dame Ottoline Leyser, Fellow, Royal Society	
*	Professor Chris Whitty, Chief Scientific Adviser, Department of Health and Social Care, Interim Government Chief Scientific Adviser and Interim Head of Government Science and Engineering Profession	QQ 160–167
*	Professor Dame Sally Davies, Chief Medical Officer for England, Department of Health and Social Care	
**	Dr Michael Hopkins, Senior Lecturer, Science Policy Research Unit (SPRU), Sussex University	QQ 168–179
*	Professor Andy Westwood, Member, Industrial Strategy Commission, and Professor of Government Practice and Vice Dean of Humanities, University of Manchester	
**	Erik Nordkamp, Chair, American Pharmaceutical Group, and UK Managing Director, Pfizer	QQ 180–196
**	Mark Hicken, Vice Chair, American Pharmaceutical Group, and UK Managing Director, Janssen	
**	Louise Houson, UK Managing Director, MSD	

*	Professor Sir John Bell, Regius Professor of Medicine, University of Oxford and Chair, Office for Strategic Coordination of Health Research (OSCHR)	QQ 197–238
**	Professor Sir Mark Walport FRS, CEO designate, UK Research and Innovation (UKRI)	QQ 239–254
**	Professor Tim Evans, National Director of Clinical Productivity, NHS Improvement	QQ 255–261
**	Miles Scott, Improvement Director, NHS Improvement	
**	Dr Mark Downs CSci FRSB, Chief Executive, Royal Society of Biology	QQ 262–271
**	Professor Paul Kellam, Chair-Elect of the Policy Committee, Microbiology Society	
*	John Bassett, Policy and Scientific Development Director, Institute of Food Science and Technology	
**	The Rt Hon the Lord Henley, Parliamentary Under-Secretary of State, Department for Business, Energy and Industrial Strategy (BEIS)	QQ 272–285
**	The Lord O'Shaughnessy, Parliamentary Under-Secretary of State, Department of Health and Social Care	
**	Professor Tony Young, National Clinical Director, Innovation NHS England	QQ 286–295

Alphabetical list of all witnesses

	AbbVie	LSI0068
**	Academy of Medical Sciences (AMS) (QQ 54–59)	LSI0107
	AHSN (Academic Health Science Networks) Network	LSI0028
	Alan Turing Institute	LSI0080
*	Albion Capital (QQ 127–134)	
	Alzheimer's Research UK	LSI0024
**	American Pharmaceutical Group (APG) (QQ 180–196)	LSI0110
	Arthritis Research UK	LSI0057
	Association of British Healthcare Industries (ABHI)	LSI0091
**	Association of Medical Research Charities (AMRC) (QQ 46–53)	LSI0098
**	Association of the British Pharmaceutical Industry (ABPI) (QQ 46–53)	LSI0102
	Association of UK University Hospitals (AUKUH)	LSI0081
	Asthma UK	LSI0051
**	AstraZeneca (QQ 22–26)	LSI0117
*	AXA Framlington Biotech Fund (QQ 127–134)	
	Babraham Research Campus (BRC)	LSI0086

	Dr Geoff Baldwin	LSI0005
*	Professor Sir John Bell, Regius Professor of Medicine, University of Oxford and Chair, Office for Strategic Coordination of Health Research (OSCHR) (QQ 197–238)	
	Dr David Bennett	LSI0019
*	BioCity Nottingham Ltd (QQ 135–142)	
**	BioIndustry Association (BIA) (QQ 46–53)	LSI0017
	Birmingham Health Partners	LSI0034
	Bristol BioDesign Institute (BBI)	LSI0027
	British Academy	LSI0095
	British Heart Foundation	LSI0023
	British In Vitro Diagnostics Association (BIVDA)	LSI0030
	British Pharmacological Society (BPS)	LSI0087
	British Society for Immunology	LSI0072
*	Cambridge Enterprise (QQ 135–142)	
	Campaign for Science and Engineering (CaSE)	LSI0076
**	Cancer Research UK (CRUK) (QQ 1–8)	LSI0097
**	Cell and Gene Therapy Catapult (QQ 78–93)	LSI0108
	Centre for Process Innovation Limited (CPI)	LSI0092
	Clinigen Group plc	LSI0013
	Antonio Cunha	LSI0008
**	Deep Science Ventures (DSV) (QQ 127–134)	LSI0093
**	Department for Business, Energy and Industrial Strategy (BEIS) (QQ 272–285)	LSI0111 LSI0132
**	Department of Health and Social Care (QQ 160–167; QQ 272–285)	LSI0132
	Duchenne UK	LSI0036
*	Engineering and Physical Sciences Research Council (EPSRC) (QQ 1–8)	
	Enterprise M3 Local Enterprise Partnership	LSI0016
	F1000	LSI0006
	Faculty of Pharmaceutical Medicine (FPM)	LSI0085
	Greg Fletcher	LSI0001
	Foreign and Commonwealth Office (FCO)	LSI0121
**	Francis Crick Institute (QQ 60–68; QQ 69–77)	LSI0018
	Future Care Capital	LSI0120
	GARNet	LSI0060

	GE Healthcare	LSI0065
	Genetic Alliance UK	LSI0079
*	Genomics England and Royal Society (QQ 153–159)	
**	GSK (QQ 22–26)	LSI0115
*	The Rt Hon the Lord Heseltine CH (QQ 143–152)	
*	High Value Manufacturing Catapult (QQ 78–93)	
**	Dr Michael Hopkins, Sussex University (QQ 168–179)	LSI0127
**	Imperial College London (QQ 9–14)	LSI0112
*	Industrial Strategy Commission (QQ 168–179)	
**	Inhealthcare Ltd (QQ 27–31)	LSI0062
**	Innovate UK (QQ 78–93)	LSI0011
*	Institute for Food Science and Technology (QQ 262–271)	
	Intuitive Surgical Inc.	LSI0047
	John Innes Centre	LSI0089
	King's College London	LSI0070
	King's Health Partners	LSI0066
	Law Society of England and Wales	LSI0074
	Leeds City Region Medical Technologies	LSI0003
	Dr Paul Lewis, King's College London	LSI0007
	Life Sciences Scotland Industry Leadership Group	LSI0042
	Lilly UK	LSI0106
	Loughborough University	LSI0033
	Tom Macfarlane	LSI0094
**	Manchester University NHS Foundation Trust (QQ 39–45)	LSI0122
	MAP BioPharma	LSI0090
**	Matoke Holdings Ltd (QQ 27–31)	LSI0021
		LSI0123
	MedCity	LSI0032
	medConfidential	LSI0053
*	Medical Research Council (MRC) (QQ 1–8)	
	Medical Schools Council (MSC)	LSI0081
	Medical Technology Group (MTG)	LSI0025
**	Medicines Discovery Catapult (QQ 78–93)	LSI0116
*	Medicines and Healthcare Regulatory Agency (MHRA) (QQ 32–38)	
	Medtronic	LSI0039

	Merck	LSI0118
**	Microbiology Society (QQ 262–271)	LSI0131
	Paul Milton	LSI0056
**	MSD (QQ 180–196)	LSI0100
	National Anti-Vivisection Society	LSI0044
**	NHS England (QQ 94–109); (QQ 286–295)	LSI0114
**	NHS Improvement (QQ 255–261)	LSI0128
	NHS Innovations South East	LSI0010
**	NICE (National Institute for Health and Care Excellence) (QQ 32–38)	LSI0031
	Northern Health Science Alliance (NHSA)	LSI0105
*	Norwich Research Park (QQ 135–142)	
	Novartis	LSI0075
**	Sir Paul Nurse, Francis Crick Institute (QQ 60–68)	
	Nutrition Society	LSI0035
	P3 Medical Ltd	LSI0029
	People for the Ethical Treatment of Animals Foundation (PeTA)	LSI0043
	Pfizer UK	LSI0022
	PHG Foundation	LSI0048
	PhoreMost Ltd	LSI0045
	PraxisUnico and AURIL	LSI0071
	Quadram Institute Bioscience	LSI0020
	Queen Mary University of London	LSI0082
	Queen's University Belfast	LSI0083
	QuintilesIMS	LSI0104
**	Randox Laboratories Ltd (QQ 27–31)	LSI0063
**	Research Councils UK (RCUK) (QQ 15–21)	LSI0113
	Richmond Pharmacology	LSI0046
	Roche	LSI0073
**	Rothamsted Research (QQ 110–126)	LSI0124
**	Royal Academy of Engineering (RAEng) (QQ 54–59)	LSI0096
	Royal College of Paediatrics and Child Health (RCPCH)	LSI0026
	Royal College of Physicians (RCP)	LSI0040
	Royal Microscopical Society	LSI0038
	Royal Pharmaceutical Society	LSI0041

**	Royal Society (QQ 153–159)	LSI0119
		LSI0126
	Royal Society for the Prevention of Cruelty to Animals (RSPCA)	LSI0014
**	Royal Society of Biology (RSB) (QQ 262–271)	LSI0101
		LSI0130
	Royal Society of Chemistry	LSI0049
*	Royal Society of Edinburgh (QQ 54–59)	
*	Royal Veterinary College (QQ 110–126)	
	Russell Group	LSI0109
*	Schroders PLC (QQ 127–134)	
	Scottish Universities Life Sciences Alliance (SULSA)	LSI0037
	Shelford Group	LSI0103
	Shire Pharmaceuticals	LSI0084
**	Syngenta (QQ 110–126)	LSI0125
	Thermo Fisher Scientific	LSI0012
	UCLPartners	LSI0059
	UK Centre for Animal Law	LSI0061
**	UK Research and Innovation (UKRI) (QQ 239–254)	LSI0129
**	University College London (UCL) (QQ 9–14)	LSI0058
*	University College London Hospitals (QQ 39–45)	
*	University Hospitals Birmingham NHS Foundation Trust (QQ 39–45)	
*	University of Cambridge (QQ 9–14)	
	University of East Anglia	LSI0088
	University of Glasgow	LSI0009
	University of Leeds	LSI0069
	University of Manchester	LSI0078
**	University of Nottingham (QQ 9–14)	LSI0067
	University of Oxford	LSI0054
	University of Southampton, Institute for Life Sciences	LSI0050
	University of Surrey	LSI0077
	Urology Trade Association (UTA)	LSI0099
*	Wellcome Trust (QQ 1–8)	
	WideCells Group PLC	LSI0004

APPENDIX 3: CALL FOR EVIDENCE

The House of Lords Science and Technology Select Committee, under the Chairmanship of Lord Patel, is conducting an inquiry into *Life Sciences and the Industrial Strategy*. The Committee invites interested individuals and organisations to submit evidence to this inquiry. The deadline for written evidence submissions is Friday 15 September 2017.

Background

The UK life sciences sector is high-tech, research-intensive, diverse and innovative. According to one analysis, it contributed £30.7bn to the economy in 2015 and supports a total of 482,000 jobs.[226] However, to tackle challenges like cancer and dementia it is important that the UK continues to have a strong life sciences sector. The sector faces a number of challenges and opportunities, including Brexit, with much of the regulation of the sector coming from the EU. In this context, as part of its wider work on an Industrial Strategy the Government has asked Sir John Bell to carry out work on a Life Sciences strategy and a 'sector deal' for life sciences.[227] The Industrial Strategy green paper states that Sir John will lead work on a "new strategy to make the UK the best place in the world to invest in life sciences".[228] It is unclear how the relative attractiveness of the UK to life science investors will be assessed. The Committee is launching this inquiry now to contribute to the discussion around the strategy and the role of the Government and business in its development and implementation.

Scope

The Committee's inquiry will consider the upcoming life sciences industrial strategy, which the Government asked Sir John Bell to work on as part of its wider industrial strategy. The new life sciences industrial strategy is expected to be published during the period in which this call for evidence is open and the Committee would welcome the views of respondents on the contents of the strategy.

The Coalition government published a *UK Life Sciences strategy* in 2011, which was subsequently re-launched in 2013. The 2011 Life Sciences Strategy containing a number of "key actions". These included an early access scheme for innovative new therapies, a £310m investment to support the commercialisation of research, an enhanced UK clinical trials gateway and a number of high-level apprenticeships. The Committee will investigate the impact of this strategy and what lessons can be learned for the new strategy.

George Freeman MP served as a dedicated life sciences minister from 2014–16. However, he was not replaced in July 2016. Responsibility for Life Sciences is now split between Lord O'Shaughnessy in the Department of Health and Lord Prior in the Department of Business, Energy and Industrial Strategy. Both ministers also have other ministerial responsibilities. The Committee will investigate whether the Government has the necessary structures in place to support the life sciences sector and the life sciences industrial strategy. Furthermore it will look at how the devolved administrations will be involved in the implementation of the strategy.

226 PwC, *The Economic contribution of the UK Life Sciences industry* (March 2017): https://www.abpi.org.uk/media/1371/the_economic_contribution_of_the_uk_life_sciences_industry.pdf

227 HM Government, Press release: 'PM unveils plans for a modern Industrial Strategy fit for Global Britain', 22 January 2018: https://www.gov.uk/government/news/pm-unveils-plans-for-a-modern-industrial-strategy-fit-for-global-britain

228 Department for Business, Energy & Industrial Strategy, *Building our Industrial Strategy*

In 2014 the Government commissioned the Accelerated Access Review to look into speeding up access to innovative drugs, devices, diagnostics and digital products for NHS patients. The review was independently chaired by Sir Hugh Taylor and supported by the Wellcome Trust. In October 2016 the review published its final report. The Government has yet to respond to the report and its recommendations. The Committee will investigate how these recommendations can be implemented alongside the life sciences industrial strategy and broader issues around the collaboration between researchers and the NHS and how the NHS can use procurement to stimulate innovation in the life sciences sector.

In its previous work on the Industrial Strategy green paper the Committee heard evidence that there is a problem with the availability of patient capital in the UK for developing innovations and growing new companies. The Prime Minister announced a Patient Capital Review in November 2016, to be led by HM Treasury, which "will identify barriers to access to long-term finance for growing firms. The Committee will further investigate this problem, with particular focus on the life sciences sector.

Questions

The Committee invites submissions on the following points, with practical examples and other evidence where possible. Please only answer those questions of relevance to you. The Committee is very much interested in views from both within and outside the life sciences sector. Please also do draw the Committee's attention to any relevant issues not captured in the specific questions below:

Science and innovation

1. How can investors be encouraged to invest in turning basic life science research into new innovations in treatment? Why has investment been lacking in this sector? Does the research base have the necessary infrastructure to be world-leading?

2. Why has the UK underperformed in turning basic research in the life sciences into intellectual property? What needs to be done to address this historic weakness in the UK and grow new companies to commercialise new research and related technologies in the life sciences?

3. What can be done to ensure the UK has the necessary skills and manpower to build a world class life sciences sector, both within the research base and the NHS?

4. How does the UK compare to other countries in this sector, for example Germany and the United States?

Industrial Strategy

5. What can be learnt from the impact of the 2011 UK Life Sciences Strategy? What evidence is there that a strategy will work for the life sciences sector? How can its success be measured against its stated objectives?

6. (If published) Does the strategy contain the right recommendations? What should it contain/what is missing? How will the life sciences strategy interact with the wider industrial strategy, including regional and devolved administration strategies? How will the strategies be coordinated so that they don't operate in 'silos'?

7. What opportunities for small and medium sized enterprises (SMEs) are there/ should there be in the strategy? How can they be involved in its development and implementation?

8. Where should the funding come from to support the implementation of the strategy?

9. How do the devolved administrations and city regions fit into the strategy? Scotland has its own life sciences strategy, how will the two interact?

NHS procurement and collaboration

10. How can public procurement, in particular by the NHS, be an effective stimulus for innovation in the Life Sciences Sector? Can it help support emerging businesses in the Life Sciences sector?

11. How can the recommendations of the Accelerated Access Review be taken forward alongside the strategy? Will the recent changes to the NHS England approval process for drugs have a positive or negative effect on the availability of new and innovative treatments in the NHS? How can quick access to new treatments and the need to provide value for money be reconciled?

12. How can collaboration between researchers and the NHS be improved, particularly in light of increased fiscal pressures in the NHS? Will the NHS England research plan help in this regard? How can the ability of the NHS to contribute to the development of and adopting new technology be improved?

Responsibility and accountability?

13. Who should take responsibility for the implementation of the Life Sciences Industrial Strategy and to whom should they be accountable? What should the UK Government's role be? What should the role of the academic, charitable and business sectors be?

14. What is the role of companies within the sector, particularly the large pharmaceutical companies, in the implementation of the strategy? How are they accountable for its success?

15. Does the Government have the right structures in place to support the life science sector? Is the Office of Life Sciences effective? Should the Government appoint a dedicated Life Sciences Minister? If so, should that Minister have UK-wide or England-only responsibilities?

Brexit

16. What impact will Brexit have on the Life Sciences sector? Will the strategy help the sector to mitigate the risks and take advantage of the opportunities of Brexit?

17. How should the regulatory framework be changed or improved after Brexit to support the sector?

18. To what extent should the UK remain involved with and contribute to agencies such as the EMA post Brexit?

21 July 2017

APPENDIX 4: SEMINAR HELD AT THE HOUSE OF LORDS ON 12 SEPTEMBER 2017

Members of the Committee present were Lord Patel (Chairman), Lord Borwick, Lord Fox, Lord Griffiths of Fforestfach, Lord Kakkar, Lord Mair, Lord Maxton, Baroness Neville-Jones, Lord Oxburgh, Lord Vallance of Tummel and Baroness Young of Old Scone.

Presentations were heard from:

- Dr Menelas Pangalos, Executive Vice-President of AstraZeneca's Innovative Medicines and Early Development Biotech Unit, AstraZeneca;
- Lord Macpherson of Earl's Court, former Permanent Secretary HM Treasury, 2005–16;
- Professor Graeme Reid, Professor of Science and Research Policy, University College London (UCL);
- David Levinger, CEO, Aura Capital Partners and Head of Operations, Institute for Strategy, Resilience & Security, UCL; and
- Professor Steve Jackson, FRS, FMedSci is the University of Cambridge Frederick James Quick and Cancer Research UK Professor of Biology.

APPENDIX 5: COMMITTEE VISIT TO THE FRANCIS CRICK INSTITUTE ON 31 OCTOBER 2017

Members of the Committee present were Lord Patel (Chairman), Lord Borwick, Lord Fox, Lord Hunt of Chesterton, Lord Mair, Lord Maxton, Lord Oxburgh, Lord Renfrew of Kaimsthorn, Lord Vallance of Tummel and Baroness Young of Old Scone.

Members heard evidence from Sir Paul Nurse, Director and Chief Executive of the Francis Crick Institute. They heard further evidence from Dr Veronique Birault, Head of Translation, Dr Simon Boulton, Senior Group Leader, Professor Charles Swanton, Senior Group Leader, Dr Kathy Niakan, Group Leader, and Dr Caetano Reis e Sousa, Senior Group Leader at the Francis Crick Institute.

APPENDIX 6: ABBREVIATIONS, ACRONYMS AND TECHNICAL TERMS

ABHI	Association of British Healthcare Industries
ABPI	Association of the British Pharmaceutical Industry
AHSN	Academic Health Science Network
APG	American Pharmaceutical Group
AUKUH	Association of the UK University Hospital
BEIS	Department for Business, Energy and Industrial Strategy
BIA	UK BioIndustry Association
DARPA	Defence Advanced Research Projects Agency
DHSC	Department of Health and Social Care
EIS	Enterprise Investment Scheme
EU	European Union
HARP	Health Advanced Research Programme
HEFCE	Higher Education Funding Council for England
ISCF	Industrial Strategy Challenge Fund
MSC	Medical Schools Council
NHS	National Health Service
OfIS	Office for Industrial Strategy
R&D	Research and Development
REF	Research Excellence Framework
SBRI	Small Business Research Initiative
SEIS	Seed Enterprise Investment Scheme
SMEs	Small and Medium Sized Enterprises
STEM	Science, Technology, Engineering and Mathematics
UKRI	UK Research and Innovation
VCTs	Venture Capital Trusts