European Commission

Roadmap for EU - USA S&T cooperation

1. USA AS A PARTNER OF THE EU

The United States of America (US) is a long standing partner of the European Union, relations being formalised in 1990 with the adoption of the Transatlantic Declaration. Following the 2007 US-EU Summit, a Declaration on Enhancing Transatlantic Economic Integration and Growth laid the foundation for a growth-driven dialogue. Since then, the Transatlantic Economic Council has become an important forum for economic dialogue between the EU and the US. The European Union and the United States have the largest bilateral trade relationship and enjoy the most integrated economic relationship in the world. On 13 February 2013, the EU and US announced the launch of negotiations on a Transatlantic Trade and Investment Partnership (TTIP).

[Latest EU-USA Summit]

The statement by EU and US leaders following the EU-US Summit in March 2014, underlined a commitment of the parties "to expand cooperation in research, innovation and new emerging technologies, and protection of intellectual property rights as strong drivers for increased trade and future economic growth". In this context specific references were made to space cooperation, the Transatlantic Ocean Research Alliance and the GPS/Galileo agreement. Equally prominent in that section were references to the Transatlantic Economic Council to “continue its work to improve cooperation in emerging sectors, specifically e-mobility, e-health and new activities under the Innovation Action Partnership”.

Other important references were made to the EU-US Energy Council, where the partners “remain committed to close cooperation on energy research and innovation in areas including energy efficiency, smart and resilient energy grids and storage, advanced materials including critical materials for safe and sustainable energy supply, nuclear energy and interoperability of standards for electric vehicles and smart grid technologies”, as well as “knowledge-sharing on carbon capture and storage, and on the sustainable development of unconventional energy resources”.

[EU-USA non-S&T cooperation agreements]

Euratom and USA signed a bilateral cooperation Agreement on fusion energy research in 2001 and the Agreement on ITER-IO (International Thermonuclear Experimental Reactor International Organisation) in 2006. In fission research, Euratom signed a Technical Exchange and Cooperation Arrangement on Nuclear Technology research with US Department of Energy (2003) and another one on Nuclear Safety research with US Nuclear Regulatory Commission (2009). Both sides are members of the inter-governmental multilateral agreement Generation IV International Forum (GIF) on research for the next generation of nuclear reactors. All bilateral nuclear research cooperation is framed under the US-EU Energy Council, in particular within the Working Group II on Technology, Research and Development.

[EU-USA S&T cooperation agreements]

Research and innovation cooperation between the EU and the US is governed by the Agreement for Scientific and Technological Cooperation, which entered into force in 1998. On 18 June 2014 the EU-US S&T cooperation agreement was renewed for an additional five years with retroactive effect and is now valid until 14 October 2018. The Joint Consultative Group (JCG) which oversees this cooperation agreement last met in February 2013. On that occasion, the co-chairs of the JCG decided to convene meetings only every two years making the next one year overdue.

[R&I landscape in USA]

Among individual countries, the US remains by far the biggest R&D performer in the world, accounting for almost 30% of global R&D expenditures. 39% of its GDP comes from high-technology manufacturing and knowledge-intensive service industries. It has a research intensity of 2.7%.1

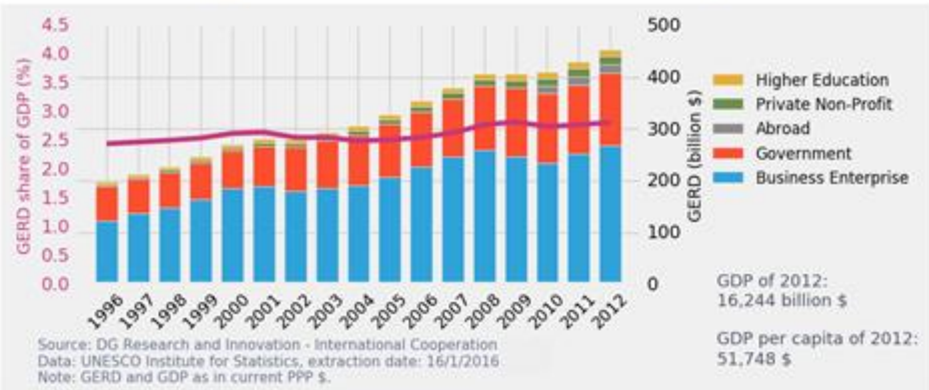
The US federal investment in research and development (R&D) largely stagnated after 2010, with recent years seeing a gradual recovery to pre-crisis levels. US business however has maintained its commitment to invest in R&D, particularly in growing, high opportunity sectors. As a result, total R&D spending has decreased slightly and the balance of spending has shifted further towards industrial investment. Gross domestic expenditure on research and development (GERD) is now rising, as is the share performed by the business enterprise sector.

The federal government is the primary funder of basic research with technological development primarily funded by industry. While US federal investment in R&D has somewhat stagnated since 2010, US business has increased its R&D investments, particularly in growing, high-opportunity sectors. Throughout a large country like the US certain States like California or Massachusetts play a dominant role in the overall global scientific impact of the country. Interestingly, while the USA is the current world leader in R&D, other countries are catching up and the gap to the followers is shrinking.

The US provides innovation-friendly framework conditions and its investment climate makes it an attractive place to commercialize innovative products, services and solutions. In addition, the US has one of the world's strongest legal systems for the protection of intellectual property rights.

The U.S has established a global network of scientific cooperation and is also a privileged partner country for many EU Member States in science, technology or innovation cooperation.

Figure 1: United States – R&D landscape



Details: Research & Development (R&D) intensity, Gross Expenditures in R&D (GERD) and Gross Domestic Product (GDP).

[1] National Science Board Science and Engineering Indicators 2016: http://www.nsf.gov/statistics/2016/nsb20161/#/report

2. State of play of EU-USA S&T cooperation

2.1 On-going FP7 and Horizon 2020 cooperation

EU-US scientific cooperation takes place under the auspices of the Joint Consultative Group, the EU-US Space Dialogue, the Transatlantic Ocean Research Alliance, the Energy Council and the Transatlantic Economic Council.

Based on the work of the Joint Consultative Group (JCG), established under the EU-US S&T agreement, cooperation on research and innovation with the USA is addressing four priority areas:

- Marine and Arctic Research

  The US has enormous research capabilities in marine and Arctic research. The National Oceanic and Atmospheric Administration (NOAA) is the largest organisation of its kind in the world with an annual budget of more than US$ 5 billion; in 2012 the JRC signed an Implementing Arrangement on scientific cooperation with NOAA. The US has access to important waters and territories (including the Arctic) and launched in 2013 strategies for oceans[2] and Arctic[3]. The US currently chairs the Arctic Council (2015-2017) to which the EU has been invited to observe proceedings since May 2013[4]. Since the signing of the Galway Statement in May 2013 and the launch of working groups (on marine research and on Arctic research) cooperation continues to gather momentum and international recognition. In spite of its formal bilateral genesis (EU-US and EU-Canada), to all intents and purposes, in the past year the cooperation has become effectively trilateral.

  Under Horizon 2020, coordination on Arctic research has started and will connect the European scientific community with scientists and networks in US, Canada and elsewhere. DG RTD is also developing a pilot cooperation action with the European Space Agency (ESA) on the Arctic. The objective is to better link the EU Arctic policy needs with the research dimension and the definition of new Earth observation activities which may in the future generate operational products. ESA has already Canada among its Council members, and has very close links with NASA and NOAA.

- Research Infrastructures

  In the domain of Research Infrastructures a number of collaborative initiatives have been ongoing amongst European facilities and their US counterparts such as those conducted in the frame of the CERN LHC or the dialogues set up in the Environmental and Earth Sciences domain where Research Infrastructures play an important role in supporting the Transatlantic Ocean Research Alliance. As such, in 2015 the 2nd Trilateral symposium on marine and Arctic Research Infrastructures in Halifax led to an agreement by all parts involved on a requirement for sustained international collaboration in this domain. Shared use of RIs (in the context of already agreed aligned research priorities and synchronised or complementary projects) is an emerging topic in the general context of the Transatlantic Ocean Research Alliance. The US is also an active member of the G7 led Group of Senior Officials on global Research Infrastructures.

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[2] http://www.whitehouse.gov//sites/default/files/national_ocean_policy_implementation_plan.pdf

[3] http://www.whitehouse.gov/sites/default/files/microsites/ostp/2013_arctic_research_plan.pdf

[4] At the Kiruna Ministerial Meeting in 2013, the Arctic Council "receive[d] the application of the EU for Observer status affirmatively", but deferred a final decision. Until such time as Ministers of the Arctic States may reach a final decision, the EU may observe Council proceedings

- Health research

  The US is the EU's main partner when it comes to health research either in terms of numbers of US participations in the Framework Programme (both FP7 & Horizon 2020) projects. Most programme-level cooperation with the US is via the US National Institutes of Health (NIH) but also with the National Science Foundation (NSF) and outside government with the Bill and Melinda Gates Foundation.

  The EU and US cooperate very well in many multi-lateral initiatives. Some examples are the International Rare Disease Research Consortium (www.irdirc.org), the International Initiative for Traumatic Brain Injury (http://intbir.nih.gov/), the International Cancer Genome Consortium (ICGC), the Global Alliance of Chronic Diseases (GACD) and the Global Tuberculosis Vaccine Partnership. Both the US and the EU have strong capacities and a common vision on how to tackle the most important health problems. Moreover, both EU and US are members of the Human Frontier Science Programme (www.hfsp.org). All these areas represent the basis for continuing and extending cooperation in the future.

  Two topics of the WP 2016-2017 in Societal Challenge 1 of H2020, in the area of ICT, refer specifically to cooperation with the US.

- Transportation Research

  The main purpose of the EU-US collaboration in surface transport research is to address global societal challenges and to pursue international standardisation requirements. Mutual benefit, joint priority setting, co-funding and critical mass through programme level cooperation are the underlying features. This EU-US cooperation has been growing steadily in recent years. The US and EU signed an Implementing Arrangement at the last JCG meeting (February 2013), covering Cooperative Activities in the Field of Research, Development, Technology, and Innovation Applied to all Modes of Transport. A steering group has been established to implement the agreement. Cooperation areas include transport infrastructure, traffic management, road safety, urban freight logistics and others. A first important result of the Implementing Agreement was the organisation of 4 yearly EU-US Transportation Research Symposia. Synchronized calls for proposals were identified as a preferred cooperation modality, combining focus and flexibility.

  While cooperation tends to be more visible and effective at programme level, stimulating bottom-up project participation is an important element in EU-US "twinning" cooperation. Such twinning is made possible by collaboration between DG MOVE and DG RTD and US DoT departments/Agencies, including US Federal Highway Administration (FWHA) and the Joint Project Office (JPO).

  Furthermore since 2013 DG RTD has increased cooperation in aviation safety research, notably in the critical area of icing; in parallel DG MOVE continues cooperation on air traffic management interoperability, based on dedicated annexes to the EU-US (EC-FAA) Memorandum of Cooperation on Civil Aviation research. Since 2014 DG RTD has engaged in ever closer cooperation with DG GROW on the regulatory aspects of vehicle technologies and how these play a role in the negotiations for a Transatlantic Trade and Investment Partnership (TTIP).

  A milestone in EU-US transport cooperation was reached by the launch in 2013 and 2015 of Interoperability Centres for smart grids and e-vehicles, followed by cooperation established under the auspices of the Transatlantic Economic Council.

- Materials research / Critical Raw Materials / Nano safety and regulatory research / Health and Safety research (nano-EHS)

Started in 2011 the EU-US-Japan trilateral cooperation on critical materials provides input for future orientation to the EU-US cooperation in this area beside the discussions taking place under the Transatlantic Economic Council – Innovation Action Partnership (TEC-IAP). In nano safety and regulatory research, cooperation with the US is of special importance and is implemented through the Communities of Research. The EU promotes government-level cooperation in the OECD working party on manufactured nano-materials (in particular through the NanoReg initiative, started under FP7 and followed by further activities in H2020).

A recent reinforcement of EU-US raw materials cooperation took place via the signing of an Implementing Arrangement between DG JRC and the US Geological Survey. Specifically, the cooperation will cover Earth Sciences, Climate and Land Use Change, Ecosystems, Energy and Minerals, Environmental Health, Natural Hazards and Water.

Space related research matters is one of the areas for enhanced EU-US cooperation under the EU-US Dialogue on Space Cooperation.

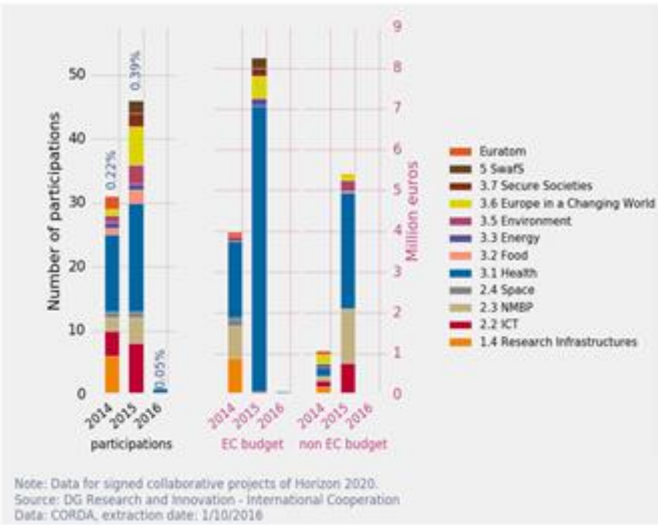

Figure 2: Unites States Participation in Horizon 2020

Thematic breakdown of participations to collaborative actions. The percent share denotes the country's participations over the total participations in the corresponding year. EC budget is the EC contribution to the participant's costs.

Concerning participation in Horizon 2020 U.S. applicants have submitted 608 proposals, involving 772 participations to collaborative actions of Horizon 2020, leading to 63 successful projects, involving 78 participations, with a success rate of 15.1% (as compared to 12.7% overall). U.S. participants have received 12.3 million euros from the European Commission and have contributed with 6.5 million euros.

The graphic above excludes the Marie Skłodowska-Curie actions (MSCA), which support the training and career development opportunities that include mobility between countries. The U.S. participates significantly: the MSCA calls in 2014 and 2015 have led to organisations there hosting Europeans on 374 occasions. 120 of these relate to Research and Innovation Staff Exchanges (RISE), 179 to Global Fellowships (GF), 59 to doctoral-level Innovative Training Networks (ITN), and 16 to researcher training programmes based in Europe that are cofunded by the MSCA. 16 American companies are participating in MSCA projects. Furthermore, 107 Americans are currently participating in the MSCA after two years of calls for proposals.

With regard to fission research cooperation, US entities participated in ten fission projects under the Euratom FP7 research programme and one participation under the Euratom Programme, complementing Horizon 2020.

The cooperation in the field of fusion research encompasses around 250 ongoing collaborative activities, involving 18 US research institutions and 19 European fusion labs under the bilateral Fusion Cooperation Agreement legal framework, aimed at supporting ITER and long-term DEMO developments.

The U.S. participates in the Intelligent Manufacturing Systems (IMS) programme established to develop the next generation of manufacturing and processing technologies involving the European Union, Mexico and South Africa.

2.2. Current framework conditions for EU-USA S&T cooperation

The general framework conditions for EU-US cooperation are improving over various Framework Programmes and the EU and the US have since several years agreed on a reciprocal opening like for example in the area of health research.

US participants will continue to be eligible to receive EU funding in projects funded through the Horizon 2020 Health challenge, reflecting the reciprocal funding offered to EU participants by the NIH.

While cooperation modes tend to become more visible and effective at programme level, bottom up project participation is also a strong feature in our cooperation. It appears that US Federal entities still perceive barriers in certain parts of the EU grant agreement for US participation in Horizon 2020. During the last Joint S&T Committee meeting between the EU and the US both sides agreed that progress on reciprocal understanding of legal, administrative and financial issues of Horizon 2020 as well as relevant US programmes was needed.

3. PRIORITIES FOR THE FUTURE IN S&T COOPERATION

3.1. Areas of future S&T cooperation agreed at latest Joint Committee/High Level Dialogues

The cooperation priorities for the years to come should be in line with the existing ones. Health research and cooperation with NIH will be a key area due to the mutual opening of the respective programmes and the level of engagement will be as in the first years of Horizon 2020.

In the area of transport research there is a clear interest in collaborating in areas where inter-operability is necessary to ensure smooth and secure transatlantic/global flows (e.g. transport management systems and cargo tracking and tracing, aviation in general).

EU-US cooperation on energy technology research and innovation continues to be promoted under the EU-US Energy Council and its Technology Working Group. Horizon 2020 has put a strong emphasis on clean energy research and innovation in Horizon 2020 compared to previous Research Framework Programmes. Indeed, there is strong potential for EU-US cooperation as follow up to COP21 and under the Mission Innovation initiative with both sides aiming to strengthen and accelerate global clean energy innovation with the objective to make clean energy widely affordable. Related research, development and demonstration issues are expected to become a major driver to focus the cooperation between the EU and US in the years to come.

Fusion energy is one of the four priority areas agreed to expand under the EU-US Energy Council. The bilateral cooperation in the field of nuclear fission energy research cooperation will continue to focus on nuclear safety as the highest priority.

A specific call in 2017 will provide European and North American researchers, industry and policymakers with a platform to enhance and deepen transatlantic dialogue on environmental issues related to Carbon Capture and Storage (CCS) and to accelerate learning and provide advanced training on unconventional hydrocarbon development. Connecting pilots and projects across the Atlantic should bring the benefits of cross-validation of technologies, sharing results, distributing tasks, bundling expertise and expanding professional networks.

The area of marine and Arctic cooperation is expected to further expand as implementation of the Galway Statement is taking shape. The type of activities could be more programme level cooperation in form of programme alignment with relevant US partners like NSF, NASA and in particular NOAA.

3.2. Potential new areas of future S&T cooperation proposed at latest Joint Committee/High Level Dialogue, through SFIC, or by thematic services

Collaboration between Europe and the United States in the domain of Research Infrastructures is considered as highly strategic especially in the frame of consolidating the support to the Transatlantic Ocean Research Alliance. Increased cooperation on marine and Arctic Research Infrastructures (interoperability, data management, better use and access, funding strategy, innovation and links with industry) is planned. The publication of the 2016 ESFRI Research Infrastructure roadmap also provides a number of additional opportunities for collaboration which could be explored in the frame of dedicated dialogues.

Over the last years regular workshops on Future Internet Experimentation have been organised between EU and US. In the annual EU-US ICT Dialogue 2016 it was agreed to explore possibilities to scale up the collaboration.

Another ICT area where a further development of EU-US cooperation is expected is cyber-physical systems (CPS). This transatlantic collaboration on societal-scale CPS should promote global standards and interoperability for safe and secure CPS platforms and applications.

3.3. Improvements in framework conditions agreed at latest Joint Committee/High Level Dialogue and additional framework conditions to be addressed at future policy dialogue meetings

Specific attention is given to improving the general framework conditions for EU-US collaboration and eliminating existing barriers (e.g. main contracting agreements) in order to ensure that the scale and scope of EU-US ST&I cooperation reach its full potential.

In October 2016 an Implementing Arrangement between the EU and the U.S. was signed that facilitates cooperation between US organisations and Horizon 2020 participants in cases where the US organisations are funded by the US and do not receive any funding from the Horizon 2020 programme. It simplifies cooperation between a selected Horizon 2020 project and a US entity by enabling researchers to organise their cooperation outside the formal Horizon 2020 Grant Agreement signed for each project, although at the same time remaining in full respect of it.

Despite some challenges to systematically integrate US entities in Horizon 2020 consortia the US is at the start of Horizon 2020 the leading 3rd country participant (in participation and funding). The 3rd country network of National Contact Points (NCPs) is the main source of guidance, practical information and assistance on all aspects of participation in Horizon 2020. It has benefited in the recent years form the 'US pilot National Contact Point' – The National Council of University Research Administrators as part of EU funded support projects.

In addition, direct scientific cooperation between DG JRC and the US is progressing with NOAA, the U.S. Geological Survey (USGS), and the U.S. Department of Energy (DOE).

Annex:

Horizon 2020 Work Programme 2016-17 topics explicitly encouraging cooperation with the US

	Topic identifier	Topic title *(click topic name to follow link)*
2016	EUJ-03-2016	Experimental testbeds on Information-Centric Networking
	ART-04-2016	Safety and end-user acceptance aspects of road automation in the transition period
	MG-3.4-2016	Transport infrastructure innovation to increase the transport system safety at modal and intermodal level (including nodes and interchanges)
	ART-05-2016	Road infrastructure to support the transition to automation and the coexistence of conventional and automated vehicles on the same network
	MG-3.5-2016	Behavioural aspects for safer transport
	MG-6.2-2016	Large-scale demonstration(s) of cooperative ITS
	NMBP-27-2016	Promoting safe innovation through global consolidation and networking of nanosafety centres
	ART-06-2016	Coordination of activities in support of road automation
	MG-6.3-2016	Roadmap, new business models, awareness raising, support and incentives for the roll-out of ITS
	GV-02-2016	Technologies for low emission light duty powertrains
	SC1-HCO-13-2016	Healthcare Workforce IT skills
	SC1-HCO-14-2016	EU-US interoperability roadmaps
	BG-09-2016	An integrated Arctic observation system
	BG-10-2016	Impact of Arctic changes on the weather and climate of the Northern Hemisphere
	SC5-15-2016-2017	Raw materials policy support actions
	SC5-16-2016-2017	Raw materials international co-operation
	SCC-04-2016	Sustainable urbanisation
	INFRAIA-01-2016-2017	Integrating Activities for Advanced Communities
	INFRAIA-02-2017	Integrating Activities for Starting Communities
	ICT-13-2016	Future Internet Experimentation
	ENG-GLOBALLY-09-2016	Centres/Networks of European research and innovation

	DS-05-2016	EU Cooperation and International Dialogues in Cybersecurity and Privacy Research and Innovation
	ICT-07-2017	5G PPP Research and Validation of critical technologies and systems
	ICT-08-2017	5G PPP Convergent Technologies
2017	INNOSUP-08-2017	A better access to industrial technologies developed overseas
	ICT-31-2017	Micro- and nanoelectronics technologies
	ENG-GLOBALLY-06-2017	The Asia-Pacific as a strategic region for Europe
	LCE-27-2017	Measuring, monitoring and controlling the risks of CCS, EGS and unconventional hydrocarbons in the subsurface
	LCE-27-2017	EGS and unconventional hydrocarbons in the subsurface
	LCE-30-2017	Geological storage pilots
	MG-3.2-2017	Protection of all road users in crashes
	ART-07-2017	Full-scale demonstration of urban road transport automation
	MG-7.1-2017	Resilience to extreme (natural and man-made) events
	GV-08-2017	Electrified urban commercial vehicles integration with fast charging infrastructure
	BG-11-2017	The effect of climate change on Arctic permafrost and its socio-economic impact, with a focus on coastal areas
	SFS-39-2017	How to tackle the childhood obesity epidemic?
	SwafS-14-2017	A Linked-up Global World of RRI

Table 1: United States - Top subdisciplines by Field-Weighted Citation Impact

Major Subdiscipline	Impact (±EU28)	Co-publications	Output
Chemistry: General Chemistry	2.04 (0.62)	38.7%	15.99%
Physics and Astronomy: General Physics and Astronomy	2.01 (0.58)	46.7%	19.61%
Materials Science: General Materials Science	2.07 (0.57)	38.8%	16.51%
Computer Science: General Computer Science	1.78 (0.56)	36.2%	13.45%
Computer Science: Software	1.85 (0.39)	34.1%	22.63%
Computer Science: Computer Networks and Communications	1.56 (0.37)	33.3%	18.18%
Physics and Astronomy: Condensed Matter Physics	1.62 (0.31)	39.1%	17.6%
Medicine: Pediatrics, Perinatology and Child Health	1.29 (0.31)	17.7%	33.73%
Medicine: Oncology	1.58 (0.29)	30.9%	30.79%
Biochemistry, Genetics and Molecular Biology: General Biochemistry,Genetics and Molecular Biology	1.82 (0.29)	42.5%	29.54%
Minor Subdiscipline	**Impact (±EU28)**	**Co-publications**	**Output**
Nursing: Care Planning	1.57 (0.98)	4.9%	75.0%
Nursing: Pharmacology (nursing)	1.34 (0.93)	7.2%	39.08%
Nursing: Nurse Assisting	0.85 (0.85)	4.2%	85.51%
Nursing: Research and Theory	1.71 (0.78)	16.7%	29.12%
Arts and Humanities: Archeology (arts and humanities)	1.99 (0.77)	34.5%	16.04%
Earth and Planetary Sciences: Economic Geology	2.04 (0.74)	49.7%	12.01%
Arts and Humanities: Language and Linguistics	1.73 (0.71)	17.0%	24.16%
Arts and Humanities: Museology	1.9 (0.69)	16.0%	28.44%
Social Sciences: Linguistics and Language	1.67 (0.63)	16.2%	24.96%
Arts and Humanities: History and Philosophy of Science	1.76 (0.58)	18.9%	34.09%

Social Sciences and Humanities
Exact Sciences and Engineering
Life Sciences

Source: DG Research and Innovation, Dir. C – International Cooperation
Data: Elsevier SciVal; extraction date: 6/2/2016; publications' window : 2012-2014
Note: Categorisation according to Elsevier 'All Science Journal Classification'. Major (minor) subdisciplines are those with a publication share >0.3% (≤0.3%) among the publication output of the country. For each subdiscipline, (±EU28) shows the difference with the impact for EU28. 'Co-publications' is the share of international publications and 'Output' is the share in the world's publications.

Table 2: United States - Top-10 technology shares in PCT patent publications

Technology	2014 share (% change from 2010)	EU28 2014 share
IT methods for management	46.9% (-3.9%)	12.0%
Computer technology	45.6% (3.9%)	12.7%
Medical technology	44.1% (-1.2%)	20.6%
Pharmaceuticals	42.0% (2.9%)	21.2%
Biotechnology	41.2% (0.9%)	25.6%
Analysis of biological materials	39.4% (-1.8%)	29.9%
Basic communication processes	35.0% (2.6%)	21.5%
Basic materials chemistry	34.8% (-1.0%)	26.4%
Civil engineering	32.5% (5.3%)	28.7%
Organic fine chemistry	31.3% (2.9%)	31.6%

Note: Statistics based on PCT publications by technology; total count by applicant's origin.
Source: DG Research and Innovation, Dir. C – International Cooperation
Data: WIPO, extraction date: 1/2/2016