CHAPTER 8

Invention, Knowledge Transfer, and Innovation

List of Appendix Tables

APPENDIX TABLE 8-1

USPTO patents granted, by sector: 2002–16

(Number)

Owner and sector	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total	167,400	169,077	164,384	143,891	173,822	157,331	157,788	167,463	219,848	224,871	253,624	278,517	301,643	299,382	304,126
Assigned to foreign owner	77,890	79,095	78,148	67,374	81,979	75,922	77,887	82,730	108,663	112,672	128,226	138,872	149,765	150,716	152,371
Assigned to owner from unknown location	49	37	23	202	247	268	273	282	426	317	310	393	430	420	482
Assigned to U.S. owner	89,462	89,946	86,213	76,315	91,596	81,141	79,628	84,451	110,759	111,882	125,089	139,251	151,448	148,246	151,272
Government	1,117	1,082	1,019	846	1,009	948	907	933	1,260	1,197	1,355	1,452	1,436	1,380	1,303
Private	70,299	71,418	69,401	61,921	74,810	66,762	66,395	70,993	92,481	94,503	106,000	118,228	129,247	126,112	129,024
Academic	3,461	3,473	3,219	2,883	3,525	3,221	3,030	3,282	4,543	4,433	5,057	5,636	6,107	6,191	6,639
Individual	14,104	13,529	12,165	10,342	11,840	9,879	9,006	8,911	11,994	11,264	12,138	13,332	13,859	13,668	13,578
Other	406	375	356	289	368	298	261	298	444	438	483	558	554	514	471
Unclassified	75	69	53	33	44	33	29	34	36	47	54	46	244	382	258

USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent ownership information. Patents are credited on a fractional-count basis (i.e., for articles with collaborating institutions, each institution receives fractional credit on the basis of its proportion among participating institutions). Private covers the for-profit business sector. Government includes federal, state, local, and municipal and federally funded research and development centers. Other includes private nonprofits, including foundations, associations, nonacademic hospitals, and research-performing institutions.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics; SRI International; Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

CHAPTER 8 | Invention, Knowledge Transfer, and Innovation

Science and Engineering Indicators 2018

APPENDIX TABLE 8-2

U.S. university patent awards, by technology area: 1996–2016

(Number)

Technology area	1996–2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All university patents	83,443	2,279	2,658	3,432	3,628	3,307	3,438	3,461	3,473	3,219	2,883	3,525	3,221	3,030	3,282	4,543	4,433	5,057	5,636	6,107	6,191	6,639
Biotechnology	14,728	401	605	822	891	722	791	710	622	567	485	671	607	555	602	746	690	760	792	888	850	953
Pharmaceuticals	12,043	359	481	599	656	602	571	575	512	430	369	455	395	366	379	562	524	655	727	876	941	1,008
Medical technology	6,809	171	178	236	273	225	225	236	311	228	200	223	187	210	216	345	375	451	561	622	651	683
Measurement	6,070	177	176	188	223	214	225	216	252	288	246	279	262	282	282	345	375	393	401	391	415	438
Organic fine chemistry	5,829	194	206	242	232	245	250	295	250	201	202	251	215	190	221	309	254	358	379	423	432	480
Computer technology	4,217	79	83	120	99	92	118	119	119	136	122	180	169	167	185	284	285	338	356	393	365	406
Analysis of biological materials	3,999	84	105	181	160	129	163	143	141	138	124	148	155	182	176	274	257	247	300	308	288	296
Optics	2,856	64	83	101	105	127	102	140	135	152	145	149	140	137	138	155	126	168	157	177	181	175
Semiconductors	2,676	50	65	70	77	81	99	106	137	99	98	101	95	79	112	162	165	171	206	229	229	244
Electrical machinery, apparatus, energy	2,652	76	73	88	99	80	80	87	99	113	98	124	100	90	99	165	133	155	179	220	231	264
Microstructural and nanotechnology	2,166	24	30	40	37	47	50	65	83	93	91	115	115	109	111	146	161	149	191	183	184	143
Chemical engineering	2,079	63	58	79	85	77	76	70	99	88	82	82	74	73	71	121	107	123	147	152	172	178
Macromolecular chemistry, polymers	1,631	74	52	59	77	69	74	77	88	57	52	68	59	40	57	93	81	81	117	109	116	131
Basic materials chemistry	1,589	55	68	55	67	61	71	51	70	59	54	60	44	47	53	73	85	96	138	118	124	139
Materials, metallurgy	1,416	58	52	67	60	58	59	62	61	51	49	55	53	40	62	74	76	82	99	86	103	111

Technology area	1996–2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Other special machines	1,346	33	47	62	61	64	70	78	73	53	54	51	56	43	52	70	67	71	83	78	84	94
Digital communication	1,228	14	9	14	11	25	27	25	22	32	35	63	61	55	61	87	115	120	92	128	120	113
Surface technology, coating	1,181	37	38	38	51	61	57	56	58	49	44	40	47	43	37	67	60	73	79	78	82	87
Telecommunications	1,104	23	19	33	29	24	37	50	41	59	43	56	54	49	56	62	63	86	70	78	86	85
Audio-visual technology	962	19	26	51	42	31	44	37	41	38	35	52	40	37	36	46	40	67	71	55	75	79
Environmental technology	886	36	33	41	37	40	36	43	35	37	25	43	34	26	42	42	46	44	58	73	57	56
Basic communication processes	837	21	6	23	20	20	14	20	24	44	48	44	48	51	55	48	65	50	61	57	55	62
Engines, pumps, turbines	680	14	23	20	26	23	27	25	31	24	24	30	27	31	35	42	37	45	41	50	43	63
Food chemistry	646	43	35	44	49	43	33	28	26	19	17	26	18	11	19	27	21	35	35	35	41	41
Control	579	15	13	24	18	20	20	22	24	20	19	33	25	14	21	33	32	37	48	46	40	54
Transport	418	11	8	7	22	16	18	16	14	21	19	20	17	14	11	25	28	25	34	33	33	29
Machine tools	408	19	17	21	24	13	16	17	20	21	14	18	19	14	20	18	23	21	24	30	20	17
Civil engineering	400	9	16	17	20	22	14	18	14	20	18	9	15	11	12	16	23	19	29	28	32	36
Textile and paper machines	391	11	10	20	15	14	14	20	14	21	13	19	19	14	12	20	21	21	33	25	23	32
Mechanical elements	388	12	10	15	16	19	18	19	17	19	14	18	18	11	9	17	20	23	31	29	27	27
IT methods for management	271	2	1	8	6	7	6	3	6	3	10	14	12	15	13	21	26	23	26	35	16	19
Thermal processes and apparatus	253	11	12	13	11	7	11	10	16	15	10	11	9	8	8	12	10	8	17	19	16	19
Other consumer goods	241	9	10	12	13	11	6	9	7	8	5	5	13	4	6	13	15	16	18	17	18	25
Handling	181	5	5	9	7	3	5	7	5	5	5	4	6	4	1	9	8	14	17	18	21	21

Technology area	1996–2016	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Furniture, games	156	5	4	6	5	7	6	4	6	7	5	5	7	4	6	6	7	15	12	14	11	17
Unclassified	128	1	3	4	5	5	4	1	2	5	7	3	4	5	8	9	11	14	9	7	9	13

IT = information technology.

Note(s)

Patents are allocated according to patent inventorship information. Data include institutions affiliated with academic institutions, such as university and alumni organizations, foundations, university associations, and affiliated hospitals. Universities vary in how patents are assigned (e.g., to boards of regents, individual campuses, or entities with or without affiliation with university). Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification. For instance, a patent that is classified under five different technological fields will see each of its technological fields receive a 0.2 count of the patent, so that the patent accounts for a count of 1.0 across all technological fields. Patents were also fractionally allocated among regions, countries, or economies based on the proportion of residences of all assignees. As such, data across technical fields sum up to the total number of granted academic patents in the United States. Data across technical fields also sum up to the total number of U.S. Patent and Trademark Office (USPTO)-granted patents.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics; SRI International; Science-Metrix; USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-3

Regions, countries, or economies in USPTO patent data

(List of regions, countries, or economies in USPTO patent data)

North America	Central and South America	Europe	Middle East	Africa	Asia	Australia and Oceania
Canada	Argentina	EU	Israel	South Africa	China	Australia
Mexico	Brazil	Austria	All others	Algeria	Mainland China	New Zealand
Puerto Rico	All others	Belgium	Armenia	Angola	Hong Kong	All others
United States	Antigua and Barbuda	Denmark	Azerbaijan	Benin	Macau	Cook Islands
All others	Bahamas, The	Finland	Bahrain	Burkina Faso	India	Fiji
Greenland	Barbados	France	Iran	Cameroon	Japan	Kiribati
	Belize	Germany	Iraq	Chad	Malaysia	Marshall Islands
	Bolivia	Hungary	Jordan	Congo, Democratic Republic of the	Singapore	Nauru
	Chile	Ireland	Kuwait	Congo, Republic of the	South Korea	Palau
	Colombia	Italy	Lebanon	Côte d'Ivoire	Taiwan	Samoa
	Costa Rica	Netherlands	Oman	Djibouti	All others	Solomon Islands
	Cuba	Spain	Qatar	Egypt	Afghanistan	Vanuatu
	Dominica	Sweden	Saudi Arabia	Eritrea	Bangladesh	
	Dominican Republic	United Kingdom	Syria	Ethiopia	Brunei	

North America	Central and South America	Europe	Middle East	Africa	Asia	Australia and Oceania
	Ecuador	All others	United Arab Emirates	Gabon	Burma	
	El Salvador	Bulgaria	Yemen	Gambia, The	Cambodia	
	Grenada	Croatia		Ghana	Georgia	
	Guatemala	Cyprus		Guinea	Indonesia	
	Guyana	Czech Republic		Kenya	Kazakhstan	
	Haiti	Estonia		Liberia	Kyrgyzstan	
	Honduras	Greece		Libya	Laos	
	Jamaica	Latvia		Madagascar	Nepal	
	Nicaragua	Lithuania		Mali	North Korea	
	Panama	Luxembourg		Mauritius	Pakistan	
	Paraguay	Malta		Morocco	Papua New Guinea	
	Peru	Poland		Namibia	Philippines	
	Saint Kitts and Nevis	Portugal		Niger	Sri Lanka	
	Saint Lucia	Romania		Nigeria	Tajikistan	
	Saint Vincent and the Grenadines	Slovakia		Rwanda	Thailand	
	Suriname	Slovenia		Senegal	Uzbekistan	
	Trinidad and Tobago	Other Europe		Seychelles	Vietnam	
	Uruguay	Former Soviet Union		Sierra Leone		
	Venezuela	Belarus		Swaziland		

North America	Central and South America	Europe	Middle East	Africa	Asia	Australia and Oceania
		Moldova		Tanzania		
		Ukraine		Togo		
		Norway		Tunisia		
		Russia		Uganda		
		Switzerland		Zambia		
		All others		Zimbabwe		
		Albania				
		Andorra				
		Bosnia and Herzegovina				
		Iceland				
		Liechtenstein				
		Macedonia				
		Monaco				
		Montenegro				
		San Marino				
		Serbia				
		Turkey				
		Vatican City				

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Source(s)

Science-Metrix; PatentsView and USPTO patent data.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-4

USPTO patents granted, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	157,595	166,158	167,400	169,077	164,384	143,891	173,822	157,331	157,788	167,463	219,848	224,871	253,624	278,517	301,643	299,382	304,126
North America	88,258	91,063	90,215	91,145	87,456	77,360	93,103	82,622	80,646	85,731	112,190	113,273	126,380	139,855	151,267	147,448	149,977
Canada	3,401	3,594	3,448	3,448	3,395	2,918	3,598	3,341	3,370	3,667	4,856	5,052	5,758	6,533	7,032	6,735	6,503
Mexico	79	90	108	91	91	82	72	59	64	64	101	103	135	164	185	182	238
Puerto Rico	26	12	13	27	18	25	27	30	17	15	26	26	37	22	41	33	46
United States	84,751	87,367	86,646	87,579	83,953	74,334	89,406	79,192	77,195	81,986	107,206	108,092	120,451	133,135	144,008	140,498	143,190
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Central and South America	238	255	240	277	222	157	236	200	208	239	319	390	407	498	613	602	569
Argentina	55	50	54	61	47	27	42	40	35	47	47	60	68	83	77	75	90
Brazil	102	116	99	132	106	75	129	92	101	111	181	223	201	261	352	337	318
All others	80	90	87	84	69	54	65	68	72	81	91	106	138	154	183	190	162
Europe	27,097	29,379	29,165	28,878	26,854	22,727	26,307	23,686	23,683	24,115	33,128	33,465	39,083	44,392	48,732	48,580	49,105
EU	25,224	27,332	27,234	26,964	25,062	21,278	24,560	22,125	21,999	22,356	30,735	30,917	36,225	40,970	44,982	44,584	44,983
Austria	520	584	532	595	546	453	561	453	455	509	740	763	871	1,014	1,213	1,180	1,367
Belgium	707	738	725	636	630	528	621	531	517	600	831	810	882	1,064	1,205	1,155	1,238
Denmark	436	489	450	537	426	370	442	395	397	393	612	737	857	923	1,065	1,012	1,084

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	618	743	824	868	924	726	954	856	824	864	1,143	960	1,060	1,227	1,363	1,386	1,513
France	3,839	4,067	4,039	3,879	3,406	2,901	3,461	3,151	3,182	3,165	4,479	4,558	5,394	6,148	6,723	6,597	6,465
Germany	10,255	11,276	11,309	11,462	10,784	9,028	10,040	9,067	8,941	9,012	12,387	11,931	13,889	15,572	16,589	16,588	15,975
Hungary	39	59	49	74	51	47	54	49	66	50	93	104	110	137	159	159	178
Ireland	129	142	126	163	185	156	186	151	174	192	278	328	356	432	506	508	590
Italy	1,703	1,728	1,760	1,723	1,605	1,315	1,493	1,317	1,369	1,377	1,842	1,922	2,167	2,531	2,653	2,687	2,712
Netherlands	1,269	1,329	1,392	1,330	1,286	1,004	1,340	1,272	1,324	1,318	1,660	1,766	1,954	2,277	2,530	2,424	2,600
Spain	275	276	323	325	273	273	312	281	317	339	436	492	673	738	805	850	795
Sweden	1,584	1,746	1,668	1,511	1,286	1,131	1,249	1,066	1,063	1,009	1,436	1,715	2,090	2,301	2,775	2,664	2,863
United Kingdom	3,696	3,989	3,859	3,661	3,478	3,166	3,625	3,309	3,115	3,233	4,394	4,375	5,343	5,927	6,604	6,506	6,603
All others	154	166	178	200	182	180	223	226	254	296	405	457	577	679	792	867	998
Other Europe	1,873	2,047	1,932	1,915	1,791	1,449	1,747	1,561	1,685	1,759	2,393	2,548	2,859	3,422	3,749	3,997	4,122
Former Soviet Union	22	33	33	30	25	24	33	30	31	26	29	35	58	53	66	78	92
Norway	247	266	249	258	247	223	238	243	263	266	391	369	445	479	549	616	609
Russia	201	255	220	223	188	168	198	199	199	216	307	331	365	439	474	498	557
Switzerland	1,343	1,428	1,366	1,335	1,267	990	1,209	1,031	1,121	1,193	1,584	1,713	1,882	2,303	2,464	2,577	2,631
All others	60	66	64	70	64	44	69	59	70	58	82	99	110	148	197	228	233
Asia	40,187	43,278	45,538	46,350	47,544	41,502	51,299	48,181	50,490	54,415	70,172	73,329	83,048	88,232	94,777	96,387	98,019
China	331	467	570	622	747	750	1,066	1,203	1,617	2,054	3,222	3,730	5,373	6,695	8,137	9,026	11,449

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	141	187	265	354	369	401	511	566	651	709	1,144	1,277	1,756	2,456	3,073	3,456	3,767
Japan	31,362	33,279	34,913	35,567	35,441	30,376	36,854	33,399	33,710	35,548	44,978	46,337	50,897	52,271	54,318	52,809	50,169
Malaysia	44	34	58	48	85	94	123	171	159	156	200	177	213	222	268	267	275
Singapore	226	307	420	438	457	345	412	390	404	435	616	650	804	793	933	961	989
South Korea	3,332	3,548	3,792	3,952	4,429	4,365	5,901	6,298	7,542	8,776	11,669	12,254	13,234	14,556	16,529	17,963	19,576
Taiwan	4,705	5,397	5,444	5,299	5,951	5,113	6,348	6,103	6,345	6,666	8,235	8,794	10,637	11,077	11,342	11,688	11,576
All others	46	57	76	69	64	59	83	50	61	71	108	111	134	162	176	216	220
Middle East	841	1,022	1,094	1,236	1,089	980	1,274	1,163	1,250	1,476	1,937	2,123	2,752	3,406	3,988	4,183	4,357
Israel	789	983	1,046	1,189	1,053	935	1,217	1,111	1,183	1,410	1,839	1,976	2,482	3,008	3,486	3,632	3,713
All others	52	39	48	47	35	44	57	52	67	66	98	147	269	398	502	551	644
Africa	130	137	129	136	124	114	128	99	109	112	151	155	188	223	235	228	254
South Africa	112	119	112	111	102	90	108	78	90	90	121	120	140	163	154	161	181
All others	19	18	17	25	22	24	21	21	19	22	30	35	49	60	82	68	73
Australia and Oceania	819	1,012	1,010	1,048	1,094	1,050	1,470	1,377	1,399	1,373	1,944	2,129	1,754	1,893	2,014	1,935	1,832
Australia	710	882	861	909	957	927	1,332	1,267	1,294	1,241	1,770	1,943	1,530	1,643	1,753	1,667	1,561
New Zealand	109	129	147	137	135	122	137	110	104	132	171	185	223	250	260	267	270
All others	0	1	1	2	2	1	1	0	0	0	3	0	0	0	1	1	2
Unclassified	25	12	9	6	1	2	4	3	3	3	7	8	12	18	16	19	12

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-5

USPTO patents granted in computer technology, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	11,891	12,719	12,890	13,655	14,646	13,635	19,092	17,583	19,107	20,881	26,714	27,309	32,611	36,778	41,080	41,530	43,210
North America	7,603	8,110	8,136	8,711	9,234	8,536	11,975	10,634	11,399	12,628	16,102	16,018	18,503	20,790	23,600	23,277	24,271
Canada	145	163	184	194	210	179	319	327	378	460	706	740	886	1,027	1,120	1,037	1,021
Mexico	2	2	0	1	3	5	3	1	0	2	2	4	6	3	5	7	15
Puerto Rico	0	0	0	0	0	0	1	0	1	0	1	1	2	1	4	3	3
United States	7,456	7,944	7,953	8,515	9,020	8,352	11,652	10,305	11,020	12,165	15,393	15,273	17,610	19,758	22,471	22,229	23,232
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	2	3	3	4	5	5	8	8	7	9	16	17	17	23	35	54	53
Argentina	0	0	0	0	1	0	2	1	0	2	1	3	4	6	5	10	10
Brazil	1	2	1	2	1	1	3	4	5	6	12	12	10	15	23	34	32
All others	1	2	2	2	2	4	2	2	3	1	3	2	4	3	7	10	12
Europe	864	1,027	1,089	1,092	1,328	1,239	1,701	1,725	1,855	2,063	2,697	2,610	3,225	3,675	4,198	4,419	4,646
EU	832	973	1,031	1,026	1,250	1,176	1,612	1,633	1,753	1,943	2,535	2,416	2,958	3,351	3,803	3,940	4,154
Austria	12	19	8	25	25	18	26	22	20	25	41	33	40	43	57	62	68
Belgium	21	22	14	14	24	14	32	28	24	30	45	43	52	62	69	58	65
Denmark	8	12	15	15	13	11	16	17	18	21	29	37	42	40	35	49	48

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	17	22	25	32	45	37	72	78	70	93	103	97	102	131	167	191	200
France	168	174	213	211	244	192	306	241	286	294	420	357	475	557	607	588	598
Germany	223	258	310	290	390	375	478	561	636	658	908	792	911	1,003	1,115	1,193	1,197
Hungary	1	1	0	2	1	2	2	2	1	1	4	11	6	7	7	15	14
Ireland	11	20	10	15	20	18	21	18	15	30	40	43	64	76	76	104	102
Italy	82	101	89	81	78	95	96	99	110	106	118	135	170	197	207	209	225
Netherlands	44	54	52	42	59	41	71	84	76	102	111	111	112	132	168	145	149
Spain	5	4	3	7	9	12	19	12	23	27	31	38	56	55	53	57	74
Sweden	43	61	53	46	45	45	66	73	61	60	89	114	156	174	191	236	277
United Kingdom	194	224	235	242	290	308	397	389	391	456	534	544	696	788	911	879	952
All others	2	2	4	3	8	8	11	11	22	41	61	62	76	86	141	154	187
Other Europe	32	55	58	66	78	63	88	92	102	120	162	194	266	324	394	479	492
Former Soviet Union	1	1	0	0	0	1	2	1	2	3	3	5	9	12	27	31	32
Norway	6	6	7	5	11	9	10	20	21	19	18	31	42	41	35	59	55
Russia	9	17	15	30	18	12	30	23	27	39	57	73	85	93	117	131	142
Switzerland	15	27	33	29	45	41	44	43	47	57	78	80	112	163	201	241	241
All others	0	3	3	2	4	1	3	5	5	3	6	5	17	15	15	18	22
Asia	3,271	3,404	3,482	3,606	3,825	3,616	5,036	4,867	5,469	5,781	7,372	7,990	9,996	11,252	11,979	12,377	12,779
China	13	26	32	34	49	56	119	158	249	346	442	517	833	1,097	1,121	1,305	1,763

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	10	17	15	40	42	57	100	123	172	214	373	442	564	851	1,100	1,278	1,303
Japan	2,508	2,610	2,676	2,773	2,805	2,574	3,493	3,183	3,390	3,358	4,140	4,469	5,342	5,707	5,772	5,396	4,964
Malaysia	2	1	2	4	3	10	12	20	22	27	30	20	35	34	35	35	47
Singapore	14	18	29	27	30	22	43	27	44	45	48	54	76	82	96	102	121
South Korea	469	441	376	350	387	435	640	716	826	997	1,427	1,464	1,683	1,856	2,170	2,466	2,931
Taiwan	253	291	350	376	508	461	627	637	762	787	907	1,009	1,450	1,607	1,667	1,778	1,625
All others	2	0	1	1	1	1	1	2	4	7	5	15	12	17	17	17	25
Middle East	111	119	128	175	175	160	220	199	237	256	336	440	653	823	1,024	1,153	1,174
Israel	109	118	125	174	173	159	214	196	234	253	328	434	628	787	991	1,115	1,112
All others	1	2	3	1	2	1	6	3	3	4	9	7	25	36	33	38	62
Africa	3	4	6	3	5	7	6	6	6	6	8	10	18	20	34	33	39
South Africa	3	3	4	2	3	7	4	3	4	3	5	4	5	6	12	15	21
All others	0	1	2	0	2	0	3	3	2	3	3	6	13	15	22	18	18
Australia and Oceania	36	51	46	64	75	72	146	145	134	137	182	224	196	193	208	215	247
Australia	32	48	44	57	71	68	137	137	123	124	167	212	174	174	191	194	223
New Zealand	4	3	1	7	4	4	9	9	11	13	15	13	22	19	17	21	24
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Unclassified	2	0	0	1	0	0	0	0	0	0	1	0	3	2	2	1	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current CPC codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-6

USPTO patents granted in semiconductors, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	8,557	10,174	10,564	10,653	10,778	9,330	10,043	9,570	9,205	10,354	14,136	14,400	13,858	15,812	17,929	18,402	19,006
North America	3,808	4,469	4,603	4,623	4,492	3,901	3,996	3,728	3,379	3,472	4,642	4,491	4,308	4,887	5,620	5,570	5,816
Canada	25	25	25	35	40	29	32	31	31	40	54	64	57	67	80	73	76
Mexico	0	1	1	0	0	2	0	1	2	0	0	1	2	0	1	1	0
Puerto Rico	1	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0	0
United States	3,782	4,443	4,576	4,587	4,452	3,871	3,962	3,696	3,346	3,433	4,588	4,426	4,249	4,820	5,539	5,495	5,739
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	0	1	0	0	0	0	0	0	0	0	1	1	0	3	2	2	2
Argentina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Brazil	0	1	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Europe	473	647	708	780	801	725	761	719	675	780	1,152	1,181	1,220	1,427	1,607	1,676	1,712
EU	453	615	673	755	776	701	735	696	657	749	1,120	1,144	1,181	1,367	1,544	1,616	1,646
Austria	12	13	9	16	14	11	13	23	18	29	42	57	65	79	105	127	164
Belgium	11	18	19	37	35	22	29	23	31	39	62	56	64	70	69	84	110
Denmark	0	2	2	3	4	2	5	1	2	3	7	4	3	5	5	1	2

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	5	5	6	4	10	12	10	9	7	11	14	14	14	12	16	17	25
France	64	96	93	101	112	99	123	116	95	129	169	185	193	241	256	267	253
Germany	196	253	302	347	403	396	386	379	352	366	613	592	603	668	787	773	741
Hungary	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1
Ireland	1	7	3	4	4	3	6	4	8	6	6	11	10	14	14	7	17
Italy	64	97	87	80	54	37	39	29	34	38	40	51	47	74	96	107	94
Netherlands	26	42	55	65	44	35	42	36	33	32	60	68	70	75	68	73	98
Spain	2	1	3	2	0	2	2	1	3	1	1	2	4	5	5	6	5
Sweden	35	33	28	20	8	14	14	7	9	13	12	16	17	15	22	25	24
United Kingdom	36	47	62	76	85	67	61	65	62	78	86	83	82	103	93	118	97
All others	1	2	3	1	2	0	4	1	3	3	6	4	9	7	8	11	17
Other Europe	20	31	35	25	25	24	26	24	18	31	32	37	39	60	63	60	66
Former Soviet Union	1	0	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0
Norway	0	0	2	0	4	2	2	2	1	1	1	2	1	3	8	4	5
Russia	6	10	6	3	2	3	3	2	3	2	3	4	3	3	6	3	4
Switzerland	12	20	26	20	20	18	20	19	14	27	27	30	32	53	47	49	53
All others	0	1	0	0	0	0	1	0	0	0	0	2	1	1	2	3	4
Asia	4,254	5,026	5,224	5,212	5,446	4,669	5,258	5,092	5,122	6,068	8,294	8,678	8,278	9,449	10,631	11,093	11,402
China	5	12	26	32	48	57	69	105	109	121	177	188	237	364	499	628	817

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	2	2	2	5	4	1	3	5	4	3	6	5	14	22	18	15	37
Japan	2,386	2,727	3,103	3,255	3,357	2,826	3,062	2,830	2,682	3,199	4,400	4,532	4,290	4,763	5,008	4,922	4,557
Malaysia	4	11	17	11	24	27	32	48	32	34	53	53	47	40	63	81	54
Singapore	70	128	169	148	135	103	123	119	104	103	202	246	253	269	275	257	249
South Korea	548	626	707	690	751	734	951	1,050	1,218	1,642	2,220	2,323	1,993	2,175	2,547	2,745	2,840
Taiwan	1,233	1,516	1,187	1,055	1,109	906	1,001	922	963	953	1,211	1,309	1,424	1,797	2,204	2,416	2,821
All others	5	5	12	17	17	14	18	13	11	12	26	21	20	19	17	28	27
Middle East	16	30	24	27	26	24	18	22	19	21	29	23	34	33	46	44	55
Israel	16	30	23	26	25	22	18	21	18	20	29	20	31	29	43	36	45
All others	0	1	1	1	1	2	1	1	1	1	0	3	4	4	3	8	10
Africa	2	0	1	1	1	0	0	0	1	1	2	2	0	3	7	3	4
South Africa	2	0	0	0	0	0	0	0	0	0	2	2	0	1	5	2	4
All others	1	0	1	1	1	0	0	0	1	1	0	1	0	2	2	1	0
Australia and Oceania	3	2	5	9	12	11	9	8	8	12	16	23	16	9	16	15	15
Australia	2	2	3	8	11	11	9	8	8	11	16	23	15	8	14	14	15
New Zealand	1	0	1	1	1	0	0	0	0	1	0	0	1	1	2	1	0
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Unclassified	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-7

USPTO patents granted in telecommunications, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	5,502	5,748	5,886	6,047	6,516	5,998	8,317	6,928	7,076	7,225	8,571	9,200	11,357	12,107	12,513	11,732	11,106
North America	3,006	3,163	3,196	3,186	3,533	3,202	4,402	3,593	3,463	3,564	4,143	4,496	5,293	5,776	5,981	5,523	5,164
Canada	161	168	147	158	183	174	246	207	195	226	252	306	393	441	455	390	349
Mexico	1	1	1	3	5	3	2	1	0	0	1	0	1	2	3	2	9
Puerto Rico	1	0	0	0	1	0	1	0	0	0	0	0	2	1	1	1	1
United States	2,843	2,994	3,047	3,026	3,345	3,025	4,153	3,385	3,268	3,338	3,890	4,190	4,897	5,332	5,522	5,130	4,805
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Central and South America	2	0	2	0	1	0	2	1	4	6	5	7	8	5	18	14	11
Argentina	1	0	0	0	0	0	0	0	0	3	0	2	2	2	3	3	3
Brazil	1	0	1	0	0	0	1	1	3	2	2	4	4	2	13	8	6
All others	0	0	1	0	0	0	0	0	1	2	3	1	2	2	3	3	3
Europe	767	856	892	926	929	819	1,089	877	875	824	1,023	989	1,242	1,362	1,497	1,471	1,485
EU	744	828	863	897	886	783	1,043	847	842	794	976	945	1,191	1,311	1,441	1,403	1,400
Austria	8	3	6	13	10	17	13	7	16	12	18	20	30	19	35	27	28
Belgium	12	14	8	15	19	19	24	18	21	17	17	14	13	24	27	30	32
Denmark	13	13	16	17	12	14	19	15	15	11	13	12	26	34	44	27	37

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	95	96	109	132	119	100	138	130	111	116	123	112	97	120	109	103	114
France	117	139	137	129	134	108	163	108	112	111	142	132	180	195	183	215	203
Germany	150	198	205	241	263	234	296	257	218	217	256	210	273	281	360	305	302
Hungary	1	1	0	6	1	1	2	2	1	2	3	0	4	2	6	2	6
Ireland	3	4	4	5	11	6	9	5	9	10	17	14	22	20	24	36	31
Italy	16	20	19	26	30	28	37	31	44	29	48	47	55	75	79	65	65
Netherlands	33	27	27	21	34	19	30	27	46	26	33	41	60	68	62	66	65
Spain	5	6	3	10	7	9	23	18	26	18	16	27	45	41	37	47	35
Sweden	130	131	146	125	70	77	85	56	65	68	127	126	152	175	214	213	233
United Kingdom	161	174	179	156	173	145	198	167	152	146	150	169	211	232	242	241	216
All others	1	2	2	2	4	6	5	5	6	11	14	19	23	25	21	27	33
Other Europe	23	28	30	29	43	36	46	30	32	30	46	44	52	51	56	68	85
Former Soviet Union	0	1	0	0	0	0	0	1	0	0	0	4	4	0	0	2	2
Norway	2	3	6	7	6	5	8	6	6	3	7	7	5	5	7	8	9
Russia	3	7	4	2	8	6	7	8	6	10	10	11	12	13	18	28	32
Switzerland	16	15	17	18	22	23	27	13	19	17	27	20	29	32	28	26	36
All others	2	2	3	2	7	2	4	2	1	1	1	2	2	1	3	4	6
Asia	1,668	1,663	1,717	1,839	1,935	1,875	2,643	2,322	2,596	2,684	3,218	3,500	4,602	4,743	4,753	4,480	4,216
China	8	7	3	12	20	23	41	40	59	94	165	243	386	395	539	504	529

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	1	2	3	2	6	7	10	18	21	16	24	34	62	83	100	123	122
Japan	1,401	1,373	1,415	1,453	1,546	1,475	2,008	1,617	1,756	1,790	2,102	2,167	2,809	2,784	2,713	2,462	2,105
Malaysia	1	3	1	0	3	1	1	4	4	6	3	5	6	5	5	11	14
Singapore	5	10	13	10	12	10	15	12	10	13	12	15	32	24	23	20	23
South Korea	158	156	157	201	180	210	317	341	412	442	565	626	821	973	917	926	980
Taiwan	91	111	124	161	168	149	250	290	332	324	345	410	480	474	452	431	438
All others	2	0	0	0	1	0	0	0	1	0	1	1	5	4	4	3	5
Middle East	38	43	43	66	77	58	96	78	78	82	101	109	157	182	211	198	179
Israel	38	42	43	65	77	58	94	77	77	82	99	107	151	177	196	182	167
All others	0	1	1	0	0	1	1	1	0	0	2	3	6	5	16	15	11
Africa	2	2	3	1	3	3	3	3	2	2	3	2	5	3	6	8	4
South Africa	1	2	3	1	3	1	2	2	2	2	3	1	1	1	3	5	2
All others	1	1	0	0	0	2	1	1	0	0	0	1	4	1	3	3	2
Australia and Oceania	19	19	32	30	37	41	84	55	60	61	77	94	48	36	47	38	45
Australia	15	14	28	21	36	38	79	54	57	59	74	88	43	32	40	35	44
New Zealand	3	5	4	9	1	3	5	1	3	2	3	6	6	4	6	3	1
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	2	2	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-8

USPTO patents granted in digital communication, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	4,233	4,426	4,823	5,292	6,436	6,318	9,818	9,003	10,354	12,000	16,182	17,645	21,048	23,942	28,395	27,932	28,932
North America	2,743	2,819	2,999	3,298	4,142	4,054	6,304	5,656	6,385	7,478	9,851	10,359	11,973	13,384	16,024	16,070	15,892
Canada	147	149	146	169	212	193	303	290	380	423	583	653	825	981	1,138	1,024	878
Mexico	1	2	3	3	2	3	2	0	1	0	1	1	2	1	1	2	5
Puerto Rico	0	0	0	0	1	0	0	1	0	1	0	0	1	0	1	1	0
United States	2,595	2,668	2,850	3,126	3,927	3,858	5,999	5,366	6,004	7,054	9,267	9,705	11,145	12,402	14,882	15,044	15,009
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Central and South America	1	0	2	0	2	2	4	4	5	7	9	9	15	26	30	30	31
Argentina	0	0	0	0	0	0	0	3	0	1	3	1	4	8	6	6	7
Brazil	0	0	2	0	1	1	1	1	3	3	2	6	7	12	17	20	17
All others	1	0	0	0	0	0	3	1	2	3	4	2	4	6	6	4	6
Europe	592	631	743	848	969	937	1,359	1,221	1,405	1,476	2,037	2,293	2,774	3,254	3,998	3,751	4,042
EU	577	609	719	818	935	900	1,308	1,170	1,339	1,405	1,937	2,182	2,647	3,125	3,821	3,551	3,803
Austria	3	3	7	7	7	6	13	5	10	18	23	23	29	32	38	36	41
Belgium	7	9	11	13	23	26	29	19	28	39	44	51	55	56	68	65	79
Denmark	2	2	5	12	8	16	26	21	16	22	26	33	37	44	37	57	37

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	86	99	134	159	221	152	258	255	270	260	333	285	326	373	433	389	410
France	95	99	109	120	135	128	194	187	236	194	303	341	384	440	504	431	435
Germany	106	114	132	176	170	195	313	259	292	351	461	503	522	617	748	690	693
Hungary	1	0	0	6	3	5	5	9	7	11	14	23	26	39	54	45	52
Ireland	3	12	11	12	24	11	15	12	18	14	33	40	38	45	66	70	100
Italy	8	5	11	13	15	11	32	27	38	49	64	103	120	137	124	110	105
Netherlands	29	22	28	27	34	46	58	38	54	63	79	97	107	131	161	138	160
Spain	2	4	5	3	8	6	9	18	17	18	22	27	60	82	84	76	69
Sweden	126	123	146	133	124	119	116	81	86	98	157	241	402	483	692	657	772
United Kingdom	107	117	119	133	161	174	236	228	255	247	349	384	477	583	726	705	734
All others	1	0	1	4	2	4	6	11	10	21	29	31	64	62	87	82	115
Other Europe	15	22	24	30	35	38	51	50	66	72	100	111	127	129	177	201	239
Former Soviet Union	0	1	0	0	0	1	0	2	1	0	2	1	3	4	4	5	6
Norway	1	5	6	7	6	8	5	9	10	13	15	8	13	9	22	27	36
Russia	2	2	2	1	4	2	6	7	16	14	21	31	41	35	45	56	59
Switzerland	9	8	12	20	21	23	38	30	37	44	59	66	67	74	95	98	124
All others	3	5	4	3	4	4	2	3	2	1	2	4	4	7	11	15	14
Asia	848	905	992	1,035	1,200	1,176	1,955	1,945	2,350	2,761	3,898	4,589	5,816	6,726	7,671	7,401	8,214
China	5	3	3	6	10	18	58	48	84	150	332	481	752	1,115	1,576	1,533	2,043

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	1	4	6	12	18	22	38	55	83	83	172	184	269	370	550	654	795
Japan	693	722	772	822	884	864	1,375	1,248	1,365	1,553	1,995	2,205	2,592	2,753	2,776	2,424	2,260
Malaysia	0	0	1	1	2	1	2	3	4	5	7	7	7	8	15	9	28
Singapore	5	3	15	10	10	6	15	19	14	35	35	38	41	31	42	40	45
South Korea	117	150	160	153	214	205	351	418	623	749	1,093	1,359	1,682	1,953	2,171	2,223	2,534
Taiwan	25	21	35	30	61	57	113	153	176	182	260	314	465	484	526	511	501
All others	3	2	0	0	2	1	3	1	2	3	3	2	7	11	15	7	8
Middle East	38	59	76	95	103	117	147	126	142	213	303	296	360	431	529	560	598
Israel	38	58	75	93	102	116	146	125	141	210	297	287	343	406	505	530	568
All others	0	1	1	1	1	1	2	1	1	3	6	9	17	25	24	29	30
Africa	2	1	1	1	3	3	2	2	3	1	6	4	6	9	11	12	31
South Africa	2	0	1	0	2	2	1	1	2	0	3	2	3	4	6	9	20
All others	0	1	0	1	1	1	1	1	1	1	3	2	4	5	5	3	11
Australia and Oceania	9	12	9	15	17	29	46	49	65	63	77	96	104	113	131	106	123
Australia	9	11	8	13	17	26	43	48	64	59	71	87	95	105	122	97	116
New Zealand	0	1	1	2	1	3	3	1	2	4	6	8	9	8	9	9	6
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Unclassified	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	2	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-9

USPTO patents granted in basic communication processes, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	3,063	3,340	3,489	3,587	3,668	3,303	4,322	4,142	4,032	4,256	4,897	4,628	4,557	5,060	5,124	4,678	4,675
North America	1,628	1,816	1,890	1,971	1,920	1,720	2,141	2,074	1,869	1,935	2,184	1,993	1,960	2,218	2,215	2,065	1,998
Canada	61	63	60	62	74	67	62	77	67	58	89	84	96	130	130	120	97
Mexico	0	0	0	0	0	0	0	0	0	0	1	1	1	2	1	2	2
Puerto Rico	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
United States	1,567	1,753	1,829	1,908	1,845	1,652	2,080	1,997	1,802	1,877	2,093	1,907	1,863	2,086	2,084	1,943	1,898
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	0	0	0	1	0	0	2	0	1	1	4	3	4	2	7	6	6
Argentina	0	0	0	0	0	0	2	0	0	1	1	1	1	1	1	1	0
Brazil	0	0	0	0	0	0	0	0	1	0	3	2	3	0	6	4	4
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
Europe	426	460	490	578	527	491	701	591	579	606	693	654	674	749	811	737	773
EU	409	441	476	560	509	468	662	566	551	579	654	597	622	689	752	670	705
Austria	6	6	5	17	26	24	42	26	41	42	57	43	32	32	48	42	46
Belgium	6	7	7	6	8	10	9	6	8	9	15	10	17	11	10	13	13
Denmark	3	4	8	8	11	5	15	7	16	10	10	12	13	8	14	11	7

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	12	27	35	41	25	28	29	26	13	12	30	20	13	21	20	18	21
France	81	65	72	74	86	68	88	87	84	91	96	92	134	150	119	127	113
Germany	115	108	120	177	148	149	216	186	199	197	213	165	158	179	193	197	206
Hungary	0	0	0	1	1	1	0	1	0	1	1	0	0	1	2	1	0
Ireland	5	6	5	14	12	14	18	20	18	8	13	18	16	19	29	26	21
Italy	48	57	50	39	33	24	42	33	34	41	43	30	33	39	60	46	53
Netherlands	34	38	49	54	45	29	59	58	45	42	48	61	57	77	71	54	57
Spain	2	3	0	1	1	1	1	2	3	7	5	2	4	7	6	5	5
Sweden	35	47	41	36	35	32	36	24	24	30	29	45	38	42	46	28	41
United Kingdom	62	72	82	90	76	78	99	81	61	77	83	84	89	88	107	90	106
All others	1	1	1	3	2	3	6	8	6	14	10	17	18	15	25	12	15
Other Europe	17	20	14	17	18	23	39	25	28	27	40	57	52	59	59	67	68
Former Soviet Union	0	1	0	0	0	0	1	0	0	0	0	1	5	5	2	2	4
Norway	1	4	3	2	1	1	6	6	1	1	8	5	7	10	8	11	12
Russia	4	6	2	3	2	4	3	3	6	4	6	7	16	7	6	9	9
Switzerland	12	10	9	12	15	18	28	15	21	22	26	40	21	35	42	40	40
All others	0	0	0	1	1	0	1	0	1	0	0	3	2	2	1	4	3
Asia	981	1,036	1,078	991	1,184	1,044	1,425	1,424	1,529	1,666	1,956	1,916	1,860	1,996	1,991	1,779	1,816
China	4	5	7	9	8	10	20	20	42	43	69	75	113	123	156	157	196

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	3	6	9	19	18	36	41	40	39	49	81	55	65	100	102	99	135
Japan	756	821	870	763	890	722	915	861	906	924	984	1,036	998	1,043	969	889	827
Malaysia	4	1	3	1	2	5	6	11	8	6	12	11	11	10	17	12	10
Singapore	16	10	10	12	17	10	19	28	23	34	38	27	22	21	32	29	23
South Korea	135	132	116	116	137	150	229	241	289	325	399	395	335	357	357	306	321
Taiwan	62	59	63	72	111	109	194	221	220	284	371	315	316	341	356	286	301
All others	2	2	0	0	1	1	0	1	0	1	1	1	0	1	1	2	2
Middle East	23	24	23	32	27	35	39	36	32	38	51	47	51	82	86	74	71
Israel	23	24	22	31	26	33	38	36	31	36	50	45	49	74	74	67	63
All others	0	1	1	0	1	2	1	0	1	2	0	2	2	8	11	7	8
Africa	3	1	0	1	1	1	0	1	2	0	0	4	2	2	5	6	3
South Africa	2	0	0	1	1	1	0	0	2	0	0	2	1	2	1	2	1
All others	1	1	0	1	0	0	0	1	1	0	0	2	0	0	4	5	2
Australia and Oceania	2	2	7	14	9	12	14	16	19	11	9	11	6	12	10	10	9
Australia	2	2	5	12	8	10	13	13	17	8	6	8	5	10	10	8	9
New Zealand	0	0	2	3	1	2	1	3	2	2	3	3	1	1	1	2	0
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-10

USPTO patents granted in IT methods for management, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	962	868	970	1,112	1,201	1,544	2,386	2,371	2,948	3,515	6,056	6,165	7,265	8,111	7,550	4,684	4,359
North America	777	700	776	872	931	1,184	1,821	1,832	2,296	2,820	4,951	5,052	5,958	6,716	6,120	3,666	3,374
Canada	17	14	17	12	21	29	35	42	66	76	123	139	171	191	185	139	117
Mexico	1	0	0	0	1	1	1	2	1	1	3	3	4	2	4	2	1
Puerto Rico	0	0	0	0	0	0	0	1	0	1	1	1	1	0	0	2	0
United States	759	686	759	860	909	1,154	1,785	1,788	2,229	2,742	4,824	4,908	5,782	6,522	5,931	3,522	3,256
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	1	0	2	2	2	1	1	3	2	7	8	10	7	10	14	9	12
Argentina	0	0	1	0	0	1	0	0	1	0	1	2	2	2	2	2	3
Brazil	0	0	0	1	1	1	1	2	1	4	6	7	3	6	10	5	9
All others	0	0	1	1	1	0	1	1	1	3	2	1	2	2	3	2	1
Europe	61	54	66	67	78	111	165	176	241	289	517	488	592	658	655	422	382
EU	58	52	61	64	76	105	153	158	221	268	484	455	556	612	599	394	351
Austria	1	1	0	2	2	1	1	2	2	3	6	4	4	6	6	5	3
Belgium	1	2	1	1	1	2	1	3	5	5	5	8	9	11	12	11	6
Denmark	1	1	1	1	1	2	2	5	0	4	15	4	7	9	4	2	4

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	2	1	4	5	6	10	14	9	11	10	18	18	20	27	29	28	24
France	8	10	12	6	15	18	18	23	29	25	50	55	72	61	65	48	45
Germany	15	11	10	12	20	25	43	51	79	98	192	171	205	225	190	115	91
Hungary	0	0	0	0	1	0	0	0	0	0	0	0	1	1	3	2	1
Ireland	0	1	0	1	2	2	3	4	8	8	13	17	17	16	34	25	26
Italy	3	1	2	3	2	2	4	4	4	7	13	19	20	26	22	14	14
Netherlands	8	2	5	1	2	5	9	5	7	8	19	13	16	12	9	11	6
Spain	0	0	1	0	1	0	1	2	2	2	4	10	12	6	16	7	11
Sweden	3	5	3	9	2	7	10	7	11	10	18	17	17	16	24	18	17
United Kingdom	14	18	21	26	23	29	46	40	59	81	121	107	136	168	155	91	87
All others	2	1	0	0	0	4	2	4	3	6	9	12	20	29	29	16	15
Other Europe	2	2	5	3	2	6	12	18	20	22	32	33	36	46	56	28	31
Former Soviet Union	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
Norway	0	0	2	0	0	0	1	2	3	1	2	2	3	7	6	2	2
Russia	0	1	1	1	0	1	2	3	2	3	3	2	4	4	12	6	8
Switzerland	2	1	2	3	2	5	7	13	15	17	25	28	26	29	37	19	20
All others	0	0	0	0	0	0	1	0	1	1	1	0	2	4	2	1	1
Asia	107	98	112	149	168	216	358	311	350	326	457	470	570	584	615	474	487
China	0	1	0	1	1	3	5	5	5	10	23	36	49	65	83	56	70

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	0	0	0	2	4	9	10	9	17	24	46	61	92	140	153	112	129
Japan	102	88	102	126	137	175	294	259	287	248	316	278	319	261	253	190	182
Malaysia	0	0	0	0	0	0	2	1	1	2	4	3	1	2	2	0	1
Singapore	0	0	2	1	3	2	2	3	4	4	3	9	5	10	16	10	9
South Korea	4	6	2	9	10	4	11	10	18	18	41	57	66	69	74	82	75
Taiwan	0	3	6	11	13	23	33	24	18	19	21	25	34	32	32	20	17
All others	0	0	0	0	0	0	2	1	1	2	3	1	4	6	3	3	3
Middle East	8	7	8	10	7	12	18	14	24	32	47	58	72	79	82	75	68
Israel	8	7	8	10	7	12	18	14	22	31	41	52	68	73	75	69	66
All others	1	0	0	0	0	0	1	0	2	1	6	6	4	6	8	6	2
Africa	1	3	1	2	1	0	1	0	3	2	5	8	13	7	9	5	6
South Africa	1	3	1	2	1	0	1	0	2	2	4	8	11	5	7	4	3
All others	0	0	0	0	0	0	0	0	1	0	1	0	2	2	3	0	3
Australia and Oceania	8	5	5	10	15	19	21	35	33	38	72	80	54	55	54	33	29
Australia	8	3	3	8	14	16	21	33	33	35	66	74	50	49	47	26	26
New Zealand	0	1	2	2	0	3	1	1	0	3	5	6	4	6	7	7	3
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Unclassified	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0

EU = European Union; IT = information technology; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-11

USPTO patents granted in medical technology, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	7,964	8,147	8,052	9,034	7,336	6,125	7,153	6,527	5,949	6,877	11,015	12,182	14,595	16,836	17,675	16,798	17,136
North America	5,908	5,939	5,668	6,453	5,212	4,401	5,103	4,611	4,083	4,800	7,772	8,747	10,205	11,618	12,039	11,290	11,605
Canada	125	162	141	182	122	106	109	99	95	102	161	175	190	245	246	267	262
Mexico	3	3	3	4	7	5	4	2	6	1	4	6	7	12	9	9	9
Puerto Rico	3	0	0	3	4	0	1	5	2	1	5	6	4	4	7	3	5
United States	5,777	5,773	5,523	6,264	5,079	4,290	4,988	4,504	3,980	4,696	7,602	8,559	10,004	11,357	11,776	11,011	11,329
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	30	30	35	38	16	23	12	9	9	21	18	36	42	55	52	49	34
Argentina	11	12	14	16	9	10	3	4	1	11	5	10	13	16	13	10	12
Brazil	8	8	8	12	2	6	6	1	4	2	8	15	17	17	22	21	7
All others	10	10	12	10	6	7	3	4	4	7	5	11	11	22	16	17	16
Europe	1,288	1,354	1,346	1,427	1,203	941	1,039	1,026	943	1,098	1,807	1,807	2,350	2,800	3,076	2,911	2,958
EU	1,157	1,219	1,212	1,295	1,081	840	930	921	827	970	1,609	1,573	2,068	2,477	2,709	2,504	2,607
Austria	19	20	20	29	26	19	23	12	18	26	30	39	50	58	74	64	74
Belgium	22	18	23	20	13	9	19	15	16	24	28	39	33	63	66	41	58
Denmark	34	33	36	56	35	28	33	23	27	35	52	63	77	95	122	91	88

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	26	28	27	34	32	25	27	23	21	20	41	34	33	49	55	42	52
France	163	175	159	171	131	105	103	105	114	113	188	185	249	249	312	283	262
Germany	394	427	468	443	400	278	327	377	330	434	704	625	846	1,009	987	945	962
Hungary	1	4	2	3	0	3	3	2	4	0	5	6	4	5	8	5	6
Ireland	19	10	8	21	19	27	22	22	9	25	46	56	51	59	75	61	96
Italy	71	79	84	93	78	56	59	62	55	60	90	83	104	141	150	136	136
Netherlands	73	83	76	64	59	39	46	47	42	49	81	81	113	135	172	137	146
Spain	15	7	14	16	10	8	10	17	7	4	11	14	25	33	37	35	31
Sweden	141	167	137	159	118	110	117	81	78	69	100	134	174	177	198	178	165
United Kingdom	171	158	151	177	151	126	131	125	100	108	211	194	283	377	427	450	500
All others	8	10	8	9	10	8	9	10	7	3	21	20	27	26	25	37	31
Other Europe	131	135	135	133	122	101	109	105	115	128	198	234	282	324	367	407	351
Former Soviet Union	2	0	1	3	2	0	1	3	2	2	3	2	4	0	1	2	5
Norway	12	18	16	18	16	7	13	12	6	8	25	20	25	25	24	20	13
Russia	22	15	14	14	10	13	9	12	13	15	12	18	25	26	26	25	23
Switzerland	90	96	97	92	91	72	77	68	81	92	143	175	216	254	293	324	269
All others	6	5	6	6	3	8	8	10	12	11	16	19	13	19	24	37	42
Asia	564	616	753	849	693	585	748	695	732	711	1,069	1,159	1,549	1,747	1,824	1,903	1,893
China	9	5	18	23	19	19	22	20	27	43	78	73	103	114	103	121	181

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	3	4	1	5	7	4	12	7	11	10	10	15	22	37	48	49	57
Japan	443	501	577	664	523	423	549	542	563	545	818	876	1,127	1,265	1,289	1,297	1,186
Malaysia	2	1	5	4	3	2	2	1	3	1	3	2	3	4	5	8	6
Singapore	2	4	4	6	5	3	6	3	9	8	10	10	22	19	32	32	25
South Korea	29	34	43	68	37	38	44	39	48	45	70	85	113	149	196	220	258
Taiwan	76	67	100	77	97	93	113	81	72	56	78	96	154	155	144	169	171
All others	1	1	5	1	0	2	1	2	1	2	2	2	6	3	7	8	8
Middle East	95	146	162	166	135	99	141	113	115	165	232	261	293	404	453	410	454
Israel	94	142	160	164	133	99	139	111	110	162	230	253	283	370	425	379	420
All others	1	4	1	3	2	0	2	1	5	2	2	9	9	34	28	31	33
Africa	11	4	7	10	5	7	12	5	3	6	9	11	17	10	17	15	15
South Africa	11	3	4	6	4	5	9	4	2	5	7	8	13	9	12	11	12
All others	0	1	3	4	1	2	3	0	1	1	2	3	4	2	5	4	3
Australia and Oceania	67	58	82	90	73	68	98	69	64	77	109	160	139	202	213	219	177
Australia	60	53	67	76	56	55	83	65	60	69	94	148	115	183	193	186	148
New Zealand	8	5	15	13	17	12	15	5	4	7	14	13	25	19	21	34	29
All others	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Unclassified	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-12

USPTO patents granted in biotechnology, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	3,713	4,215	3,830	3,473	3,039	2,654	3,685	3,696	3,377	3,525	4,524	4,659	4,803	5,044	5,595	5,601	5,747
North America	2,522	2,791	2,614	2,304	1,985	1,709	2,345	2,377	2,109	2,248	2,784	2,771	2,885	2,982	3,229	3,230	3,301
Canada	130	142	139	102	98	69	119	125	100	110	124	132	145	135	115	131	120
Mexico	3	4	2	2	2	1	1	0	1	3	4	2	5	5	4	2	4
Puerto Rico	0	1	0	0	0	0	1	1	0	0	1	0	1	0	0	1	2
United States	2,389	2,645	2,473	2,200	1,885	1,639	2,225	2,251	2,007	2,134	2,654	2,637	2,734	2,842	3,110	3,096	3,175
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	4	7	7	8	8	4	15	12	9	13	16	14	18	19	20	32	23
Argentina	0	1	0	0	3	0	5	2	1	4	5	3	1	2	3	4	4
Brazil	2	4	3	4	4	2	7	6	3	4	6	5	9	9	7	18	11
All others	2	2	4	3	2	2	3	4	4	4	6	6	7	9	11	10	9
Europe	747	876	736	717	622	535	674	713	670	684	914	971	1,011	1,067	1,262	1,290	1,326
EU	687	813	678	669	581	492	623	653	612	626	831	884	931	984	1,146	1,190	1,213
Austria	18	17	16	14	10	13	9	16	11	18	21	27	22	36	46	39	41
Belgium	42	39	41	32	35	23	29	42	32	37	46	46	44	49	51	50	57
Denmark	59	68	47	58	30	30	44	39	38	38	63	83	77	98	112	94	108

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	10	14	10	9	11	10	12	10	16	13	21	16	13	12	17	17	27
France	116	141	107	127	85	87	105	104	94	91	114	130	145	157	175	186	200
Germany	158	212	174	195	188	142	193	187	190	177	251	243	265	259	312	334	293
Hungary	1	5	4	5	7	3	3	3	1	1	3	2	4	1	3	5	7
Ireland	2	4	2	3	4	2	4	3	2	5	7	8	5	8	6	9	10
Italy	22	21	26	20	13	17	27	22	25	24	45	41	45	52	48	56	58
Netherlands	66	56	52	39	40	43	43	47	46	54	58	70	67	79	110	102	117
Spain	9	10	8	7	8	8	10	12	14	15	15	19	28	22	38	35	27
Sweden	27	40	40	37	36	24	28	35	34	25	32	38	45	37	53	48	44
United Kingdom	149	179	145	120	109	86	108	124	102	119	138	148	162	154	158	193	184
All others	8	9	6	2	5	5	8	9	7	10	17	13	10	21	17	21	39
Other Europe	60	63	57	48	41	43	51	60	58	58	83	87	80	83	116	99	113
Former Soviet Union	0	1	1	1	2	0	1	2	1	0	1	1	1	2	1	1	2
Norway	8	6	3	7	8	5	4	7	6	10	9	10	11	13	16	17	18
Russia	9	7	12	6	7	10	9	17	16	15	20	25	14	15	17	12	18
Switzerland	42	47	38	31	23	27	35	31	29	28	50	50	52	50	74	66	73
All others	1	2	3	3	1	2	2	3	5	4	4	1	3	3	8	3	2
Asia	361	439	377	369	360	354	548	511	507	471	683	750	731	787	899	867	908
China	6	9	13	12	13	17	26	36	29	27	46	45	59	81	100	99	129

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	8	12	19	29	22	19	27	27	22	21	33	24	30	21	37	37	45
Japan	308	340	284	271	275	261	368	347	361	308	424	511	433	458	487	472	452
Malaysia	0	0	0	0	0	1	1	3	2	2	5	3	4	4	7	3	3
Singapore	3	3	1	4	4	4	9	7	7	8	8	9	19	20	28	27	35
South Korea	24	43	34	36	27	35	74	60	47	62	102	104	110	131	159	156	175
Taiwan	11	29	25	16	18	17	40	30	35	42	60	51	75	68	80	70	65
All others	2	1	1	1	1	1	3	1	3	1	4	3	2	3	1	3	4
Middle East	30	35	34	39	26	17	38	37	32	47	54	66	73	85	90	96	98
Israel	30	34	34	39	26	16	38	36	32	47	54	66	69	83	82	90	91
All others	0	1	0	0	0	0	0	1	0	0	0	1	4	2	8	6	7
Africa	3	4	3	2	1	0	2	2	2	3	3	5	4	6	4	10	10
South Africa	1	2	2	1	1	0	1	1	1	2	2	3	4	4	3	8	8
All others	1	2	1	1	0	0	1	1	1	1	1	1	1	2	1	2	1
Australia and Oceania	44	64	58	34	36	35	62	44	49	60	70	82	81	96	91	75	80
Australia	39	60	46	28	27	32	50	37	42	48	56	66	66	79	70	60	64
New Zealand	6	4	11	5	8	3	12	7	7	11	13	16	14	17	21	16	17
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-13

USPTO patents granted in pharmaceuticals, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	3,931	4,240	4,293	3,960	2,925	2,580	3,241	2,697	2,688	2,724	3,976	4,009	4,726	5,753	6,579	6,703	6,551
North America	2,645	2,805	2,882	2,591	1,910	1,666	2,088	1,722	1,676	1,695	2,480	2,445	2,883	3,431	3,887	3,916	3,880
Canada	134	133	148	136	109	84	104	91	97	95	127	133	112	145	159	165	139
Mexico	4	2	0	5	2	2	2	1	3	4	4	6	9	13	11	8	10
Puerto Rico	0	1	2	1	0	0	1	1	1	0	3	2	2	4	2	2	4
United States	2,507	2,669	2,733	2,450	1,799	1,580	1,981	1,630	1,575	1,596	2,345	2,305	2,760	3,270	3,715	3,742	3,728
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	10	11	20	16	8	6	16	10	12	10	22	21	26	34	51	38	41
Argentina	4	7	8	9	4	1	6	4	3	4	1	6	5	9	5	5	10
Brazil	3	1	2	5	1	2	7	2	2	4	9	6	9	13	17	10	16
All others	3	3	10	2	3	2	3	4	8	3	12	10	11	13	29	24	15
Europe	875	913	873	873	637	550	665	564	594	578	885	882	1,024	1,258	1,478	1,532	1,448
EU	806	838	806	807	588	501	613	521	548	528	810	788	922	1,120	1,309	1,383	1,279
Austria	13	13	15	11	8	11	9	12	10	13	24	25	20	32	43	25	33
Belgium	36	29	42	31	33	22	31	27	27	26	43	28	34	47	52	66	66
Denmark	22	34	24	33	25	21	24	22	25	19	36	34	43	59	79	62	59

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	15	16	15	14	12	10	11	8	8	8	14	11	14	9	17	12	15
France	133	143	124	150	87	83	98	77	92	89	138	128	169	202	232	248	225
Germany	212	221	206	221	162	132	156	143	141	131	208	201	239	281	328	343	308
Hungary	4	4	8	7	5	3	4	3	5	5	7	4	6	6	3	9	7
Ireland	9	5	7	7	7	7	5	3	4	6	8	10	9	10	14	15	13
Italy	65	79	67	60	49	42	51	43	45	50	74	84	99	113	140	137	132
Netherlands	30	32	33	31	28	28	27	28	28	36	42	53	46	55	59	66	64
Spain	8	8	17	14	10	7	13	11	12	15	21	19	24	41	48	76	46
Sweden	62	55	66	62	37	35	37	28	34	26	41	41	46	46	64	65	59
United Kingdom	190	186	176	151	115	95	134	108	111	90	139	136	158	198	197	231	224
All others	8	13	7	16	10	4	13	8	6	16	13	14	14	22	33	29	30
Other Europe	69	74	68	65	49	48	53	43	46	50	75	94	102	137	169	150	169
Former Soviet Union	0	1	2	1	0	0	0	0	0	0	0	1	0	2	2	1	2
Norway	16	15	7	9	7	8	6	11	7	9	13	15	17	20	27	23	22
Russia	8	9	11	8	5	7	5	6	6	8	12	10	11	21	20	22	23
Switzerland	40	47	44	40	36	32	39	24	32	29	47	61	69	84	105	93	115
All others	5	3	4	7	2	2	3	2	1	4	2	6	5	10	15	10	6
Asia	304	402	390	363	285	282	388	318	308	332	467	501	615	805	906	959	951
China	10	17	17	18	22	25	32	37	38	32	38	44	73	103	126	147	171

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	15	29	30	46	25	31	39	30	29	22	34	41	63	86	96	121	135
Japan	239	312	287	244	180	176	250	187	170	205	279	286	305	397	429	420	339
Malaysia	0	0	2	2	1	0	1	1	2	0	3	2	4	2	9	4	5
Singapore	4	1	1	3	2	2	4	4	7	4	5	9	11	14	15	18	21
South Korea	23	28	30	32	33	25	32	35	28	32	57	58	80	99	128	138	171
Taiwan	11	13	21	17	20	22	27	22	33	35	49	58	75	99	99	102	104
All others	2	2	2	1	2	1	4	2	2	2	2	3	4	5	4	9	6
Middle East	47	41	61	62	42	40	42	43	51	57	69	84	97	127	150	148	134
Israel	45	40	59	61	41	36	41	42	51	55	67	80	91	124	134	132	114
All others	2	1	2	1	1	4	1	1	0	2	2	4	7	3	16	16	20
Africa	6	7	6	7	3	2	4	5	2	5	10	7	9	15	9	10	9
South Africa	1	4	4	5	2	1	2	2	1	2	3	3	5	9	3	7	6
All others	5	3	3	2	1	1	2	4	1	3	7	4	4	6	6	4	3
Australia and Oceania	42	60	58	48	40	34	38	36	44	47	45	70	71	81	99	96	87
Australia	34	54	44	37	30	27	34	29	38	37	36	53	58	67	89	89	76
New Zealand	7	6	14	11	9	7	5	7	7	10	8	16	13	14	10	7	10
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	1	1	3	0	0	0	0	0	0	0	0	0	1	1	0	2	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-14

USPTO patents granted in basic material chemistry, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	3,421	3,573	3,426	3,371	2,940	2,167	2,411	2,231	2,140	2,341	3,341	3,476	3,886	4,390	4,797	4,536	4,477
North America	1,869	1,839	1,744	1,702	1,457	1,088	1,230	1,107	1,064	1,189	1,696	1,789	2,005	2,238	2,466	2,193	2,135
Canada	71	71	71	61	57	38	43	39	43	74	81	99	99	118	140	123	107
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	4	2	4	3	2	1	0	4	1	2	4	5	5	7	13	10	9
United States	1	0	0	0	0	0	0	1	0	1	0	1	1	0	1	2	2
All others	1,794	1,766	1,669	1,638	1,397	1,049	1,187	1,064	1,020	1,112	1,611	1,684	1,901	2,113	2,312	2,058	2,017
Central and South America	16	11	15	16	13	9	16	11	9	13	28	25	32	21	24	27	28
Argentina	1	1	0	2	1	2	1	0	0	0	1	1	2	1	1	2	1
Brazil	7	4	4	7	5	7	10	4	6	8	15	14	9	12	14	10	20
All others	8	6	10	7	8	0	5	7	3	5	12	10	22	8	9	15	6
Europe	907	1,020	972	940	769	580	618	534	471	496	752	726	824	932	1,066	1,018	949
EU	843	944	898	882	711	539	571	494	436	447	690	673	760	852	978	930	849
Austria	4	7	8	6	5	5	6	4	2	2	5	6	9	4	13	13	11
Belgium	70	66	85	72	45	39	38	28	20	33	39	35	43	54	63	42	39
Denmark	11	21	14	18	9	7	8	13	6	8	12	19	16	19	14	17	25

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	7	11	9	8	6	4	3	8	5	5	3	11	15	10	14	17	14
France	109	101	108	101	74	59	56	69	63	58	98	96	103	124	138	126	148
Germany	382	450	425	402	337	249	279	219	204	203	297	282	347	378	456	418	346
Hungary	1	3	1	1	1	2	1	0	1	0	1	1	1	3	2	1	3
Ireland	1	2	1	3	4	3	2	3	2	2	2	3	4	5	3	5	2
Italy	38	27	41	44	20	16	20	14	19	13	23	29	23	29	24	31	30
Netherlands	56	53	49	54	44	32	41	32	15	31	49	39	41	59	65	67	65
Spain	6	10	6	7	7	7	3	3	5	4	7	9	11	11	12	16	15
Sweden	9	14	10	12	12	6	8	10	7	6	7	12	13	12	14	13	16
United Kingdom	148	179	140	153	143	106	105	89	82	79	143	129	126	134	150	152	125
All others	2	1	4	1	4	3	2	3	3	3	4	3	7	10	11	13	11
Other Europe	63	76	74	59	58	41	47	40	35	48	62	53	64	80	87	87	100
Former Soviet Union	0	2	1	0	1	0	0	1	1	0	0	1	1	2	2	1	3
Norway	5	6	4	3	7	3	3	3	5	3	7	3	7	10	10	10	10
Russia	6	5	7	6	6	4	6	8	4	5	11	5	5	10	11	10	10
Switzerland	52	63	62	50	42	33	36	28	24	37	43	42	50	58	64	64	75
All others	0	0	0	1	1	1	1	1	0	2	0	2	2	1	1	1	3
Asia	592	677	659	672	667	451	521	551	561	611	808	868	961	1,109	1,147	1,179	1,248
China	6	5	14	9	16	10	14	8	15	17	27	32	43	65	80	115	149

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	10	13	20	17	18	16	16	9	10	15	21	11	23	34	45	54	69
Japan	541	598	569	581	561	373	438	468	461	477	629	683	722	829	838	799	795
Malaysia	1	1	1	1	1	3	1	2	3	7	5	7	4	7	7	7	8
Singapore	2	2	3	3	2	1	2	4	2	3	2	3	5	6	5	13	7
South Korea	16	36	32	42	44	32	35	43	45	64	82	97	117	110	111	137	164
Taiwan	13	20	18	18	25	16	14	15	25	28	41	34	44	52	56	49	52
All others	1	2	1	2	1	1	1	1	1	1	0	1	4	5	5	4	5
Middle East	5	9	10	9	9	9	8	9	9	12	20	23	28	46	44	62	79
Israel	5	8	9	5	8	8	6	6	6	5	11	16	15	26	18	22	25
All others	0	1	1	4	1	1	2	3	2	6	9	7	13	20	26	40	54
Africa	4	4	6	8	4	7	1	6	7	5	7	9	12	12	14	9	5
South Africa	3	3	5	5	3	7	1	6	7	4	7	8	12	11	12	8	3
All others	1	1	2	4	1	0	0	0	0	1	0	0	0	1	2	1	2
Australia and Oceania	27	13	20	21	21	22	17	12	20	16	30	35	24	32	37	47	33
Australia	23	12	17	20	19	22	17	11	17	14	28	31	20	24	32	41	23
New Zealand	3	1	3	2	2	0	0	1	2	1	3	4	4	8	5	6	10
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-15

USPTO patents granted in organic chemistry, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	5,415	5,721	6,213	5,246	4,335	3,758	4,666	4,500	4,355	4,694	5,749	5,632	6,482	7,116	7,089	6,828	6,000
North America	2,618	2,677	2,974	2,563	2,078	1,881	2,339	2,148	2,103	2,252	2,744	2,581	3,006	3,323	3,320	3,189	2,896
Canada	75	75	89	76	71	49	80	76	84	99	105	109	102	110	113	101	95
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	1	1	4	2	0	0	0	4	1	2	2	2	1	3	6	6	5
United States	1	0	0	1	0	0	2	1	1	1	1	1	2	0	0	1	0
All others	2,542	2,600	2,881	2,484	2,006	1,831	2,257	2,067	2,016	2,150	2,636	2,468	2,901	3,209	3,201	3,080	2,795
Central and South America	9	6	11	8	5	4	11	3	9	10	8	12	16	20	25	22	18
Argentina	3	0	3	1	0	0	3	1	2	2	1	2	2	3	3	2	2
Brazil	4	2	6	4	4	2	4	1	4	7	7	9	9	14	16	17	12
All others	2	4	2	3	1	2	4	1	2	2	0	2	4	3	7	4	4
Europe	1,865	1,985	2,091	1,733	1,429	1,182	1,477	1,508	1,464	1,487	1,867	1,785	2,000	2,224	2,136	1,939	1,612
EU	1,731	1,842	1,945	1,618	1,304	1,100	1,358	1,413	1,341	1,354	1,691	1,601	1,817	1,997	1,955	1,768	1,428
Austria	15	17	19	12	20	10	7	15	13	12	23	10	22	24	29	26	20
Belgium	34	44	48	32	34	35	43	37	37	54	49	69	62	89	92	87	69
Denmark	40	50	47	51	37	32	31	30	25	33	57	55	52	50	31	36	32

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	9	12	20	10	13	11	7	8	7	9	12	10	9	11	13	13	8
France	387	430	469	367	247	223	259	302	279	254	310	344	332	412	362	342	283
Germany	682	710	772	623	543	406	535	507	467	483	595	491	649	746	779	647	487
Hungary	11	16	11	18	10	11	12	12	20	8	19	16	13	13	14	19	12
Ireland	1	5	5	5	3	2	2	2	1	3	5	4	4	8	6	4	6
Italy	112	102	113	85	77	79	80	85	105	88	134	115	132	142	141	131	108
Netherlands	51	59	51	47	51	43	45	54	56	55	57	61	47	58	70	79	56
Spain	18	19	33	36	19	23	35	36	40	47	55	53	78	63	56	48	50
Sweden	27	40	43	41	24	24	41	32	43	43	57	48	54	43	42	34	26
United Kingdom	332	323	294	273	211	192	235	266	235	229	290	275	327	287	283	258	224
All others	11	17	19	17	15	10	25	25	11	33	28	49	36	51	37	44	46
Other Europe	134	143	145	115	126	82	119	95	123	133	176	184	183	227	181	171	184
Former Soviet Union	0	3	2	1	2	1	1	0	2	1	0	1	4	2	3	2	2
Norway	8	5	8	6	8	4	5	2	4	7	7	10	10	14	13	14	17
Russia	12	10	9	7	7	7	9	8	6	9	11	15	7	21	17	16	13
Switzerland	111	121	122	98	105	68	99	83	106	114	153	152	159	186	145	135	149
All others	2	5	4	3	4	3	4	2	4	1	4	6	3	4	4	4	3
Asia	879	997	1,067	871	763	640	764	774	704	856	1,039	1,170	1,373	1,425	1,493	1,563	1,377
China	14	12	14	16	23	20	21	31	33	51	77	84	128	178	232	248	280

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	45	50	84	91	78	75	95	89	95	99	122	131	154	195	190	241	208
Japan	728	838	857	659	562	469	555	542	469	576	684	768	863	786	770	772	622
Malaysia	0	0	0	2	0	0	3	1	0	2	0	2	4	3	3	3	1
Singapore	1	1	1	1	3	2	3	3	2	6	4	8	16	11	20	20	15
South Korea	68	64	82	77	66	52	57	82	73	82	102	122	143	165	187	184	189
Taiwan	19	30	28	24	28	21	30	25	27	39	49	53	62	83	89	87	58
All others	3	3	2	1	3	1	2	1	4	1	1	1	4	3	2	7	3
Middle East	24	31	44	46	35	32	51	47	59	60	60	42	45	64	74	64	56
Israel	19	28	40	42	35	31	47	42	56	59	57	38	40	52	55	42	35
All others	5	3	4	3	1	1	4	5	3	1	3	5	5	12	19	23	22
Africa	4	3	5	5	5	3	2	2	4	6	4	8	3	11	3	7	9
South Africa	3	3	5	5	5	3	1	2	2	5	3	6	2	8	1	5	7
All others	1	0	0	0	0	0	1	1	2	1	1	2	0	2	1	2	2
Australia and Oceania	14	20	19	20	19	15	23	18	13	23	27	33	38	48	36	44	33
Australia	8	14	17	17	15	14	16	14	11	18	19	26	32	43	31	36	28
New Zealand	6	5	2	3	4	1	7	4	2	5	8	7	5	5	5	7	5
All others	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	2	1	2	0	0	0	0	0	0	0	0	0	1	2	1	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-16

USPTO patents granted in macromolecular chemistry, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	2,939	3,200	3,267	3,112	2,798	2,028	2,189	1,856	1,562	1,740	2,677	2,637	2,764	3,187	3,423	3,361	3,371
North America	1,410	1,501	1,553	1,414	1,199	947	994	864	738	802	1,177	1,148	1,152	1,292	1,371	1,324	1,320
Canada	38	50	62	39	43	29	31	32	29	27	47	31	37	42	49	61	55
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	1	0	1	2	1	1	0	0	2	3	1	4	2	6	3	3	3
United States	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
All others	1,371	1,450	1,490	1,373	1,155	917	963	831	707	772	1,129	1,114	1,113	1,244	1,320	1,260	1,262
Central and South America	4	2	3	2	3	2	3	1	2	3	4	5	4	3	12	8	9
Argentina	1	0	0	0	0	1	0	0	0	0	0	2	1	0	0	0	0
Brazil	3	1	2	1	2	1	1	0	1	3	3	2	3	2	9	5	8
All others	0	1	0	1	1	0	1	1	1	0	1	0	1	0	3	2	1
Europe	745	824	814	852	774	505	562	466	362	382	654	604	686	819	865	814	785
EU	701	771	767	802	737	476	538	432	337	354	611	556	630	749	811	764	717
Austria	12	13	13	9	7	5	8	5	6	7	12	7	18	18	29	21	30
Belgium	52	73	63	54	39	33	35	29	23	23	57	39	49	70	61	58	48
Denmark	3	2	5	2	3	3	2	2	2	2	3	5	3	5	10	8	10

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	12	18	17	17	12	9	5	7	9	7	13	8	9	19	16	18	17
France	84	92	88	94	89	66	69	62	43	48	74	77	86	112	119	107	106
Germany	353	385	371	419	403	246	288	203	169	154	270	272	294	328	379	332	287
Hungary	1	1	0	1	0	0	0	0	0	0	1	1	0	1	1	1	1
Ireland	1	1	0	2	1	4	1	1	3	1	4	4	6	4	6	2	2
Italy	59	68	71	59	60	32	53	39	34	48	54	45	53	56	55	56	63
Netherlands	45	53	63	68	54	23	27	36	16	26	50	37	44	48	56	63	56
Spain	5	3	4	5	4	4	4	3	1	3	5	6	5	6	8	14	7
Sweden	7	9	9	11	4	6	7	6	6	5	10	5	13	23	17	19	23
United Kingdom	60	49	56	47	56	38	34	34	19	23	48	43	42	51	45	54	57
All others	8	4	8	15	5	6	5	6	7	4	8	7	8	8	9	11	10
Other Europe	45	52	47	50	37	30	24	34	25	29	44	49	56	70	54	50	67
Former Soviet Union	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	1	2
Norway	2	4	4	10	6	5	5	2	2	4	3	6	4	7	4	3	5
Russia	6	6	2	3	2	1	1	5	3	5	5	2	3	4	5	4	6
Switzerland	34	41	38	35	28	23	15	23	16	17	32	37	45	57	42	42	52
All others	3	1	2	2	1	0	3	4	4	2	3	3	4	1	3	1	3
Asia	764	848	869	817	801	559	611	515	451	533	823	861	895	1,043	1,127	1,166	1,214
China	8	5	10	13	10	3	8	14	13	16	22	24	40	56	64	82	93

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	7	9	9	8	12	10	11	14	10	14	21	14	16	15	32	25	24
Japan	679	768	773	704	673	468	511	421	361	431	644	666	667	764	800	760	796
Malaysia	1	0	0	1	2	1	0	0	0	1	1	3	2	3	6	1	3
Singapore	1	1	3	1	2	3	4	4	1	1	4	3	5	7	9	14	10
South Korea	47	43	53	67	77	56	61	47	53	54	96	108	120	145	162	212	230
Taiwan	21	22	21	23	23	17	15	15	12	15	32	43	44	50	52	65	56
All others	1	0	0	1	2	1	1	0	0	1	2	1	1	2	3	7	1
Middle East	7	8	10	14	8	8	10	5	2	11	6	11	14	18	34	33	31
Israel	6	7	5	10	4	6	4	3	2	10	4	9	8	10	16	16	15
All others	2	1	5	4	4	2	5	1	0	1	2	3	6	8	18	17	16
Africa	1	3	5	2	1	1	0	2	1	2	1	1	1	2	1	1	1
South Africa	1	3	5	1	1	0	0	2	0	2	1	1	1	1	0	0	0
All others	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1
Australia and Oceania	6	14	11	12	12	5	9	4	6	6	11	6	11	10	12	16	10
Australia	6	12	11	11	12	5	8	3	4	5	10	5	7	10	11	15	8
New Zealand	0	1	0	0	0	0	1	1	1	0	1	1	4	0	1	1	3
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-17

USPTO patents granted in chemical engineering, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	3,425	3,452	3,322	3,309	2,977	2,572	2,722	2,459	2,461	2,468	3,416	3,462	3,682	4,008	4,354	4,594	4,741
North America	2,018	1,948	1,843	1,895	1,737	1,493	1,573	1,404	1,366	1,380	1,814	1,863	1,965	2,065	2,206	2,326	2,348
Canada	94	102	87	82	74	58	73	55	52	58	68	80	96	82	109	118	124
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	2	2	4	3	3	1	1	1	0	1	2	3	3	5	4	5	4
United States	1	0	1	0	0	1	0	1	0	1	2	0	1	0	1	1	2
All others	1,921	1,844	1,751	1,811	1,660	1,433	1,499	1,347	1,314	1,321	1,743	1,779	1,864	1,978	2,093	2,203	2,219
Central and South America	13	12	8	6	11	7	7	7	11	7	6	12	14	14	24	17	17
Argentina	3	1	1	2	1	0	1	1	0	1	1	0	1	2	1	1	0
Brazil	6	5	4	3	7	3	3	4	4	4	5	7	9	6	13	9	11
All others	5	6	3	1	3	4	3	3	6	2	1	5	4	6	10	7	5
Europe	852	896	883	833	709	610	681	570	587	558	830	843	903	1,020	1,133	1,136	1,194
EU	779	823	803	768	655	572	632	527	542	505	773	769	816	926	1,023	1,038	1,093
Austria	11	15	14	11	8	9	9	11	7	8	10	10	12	15	22	22	24
Belgium	18	24	16	16	16	15	15	11	15	15	23	26	30	35	33	35	34
Denmark	24	14	14	11	6	9	12	11	6	12	15	18	26	19	17	20	23

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	27	31	26	35	25	17	21	10	16	11	19	25	16	16	23	28	33
France	137	165	164	147	112	99	95	97	79	80	120	117	116	140	162	155	173
Germany	322	330	339	331	270	242	275	210	226	220	316	331	329	394	413	416	429
Hungary	2	0	2	1	1	1	1	1	1	0	2	1	0	3	3	3	2
Ireland	3	1	1	3	4	4	3	1	5	2	3	5	3	9	6	8	10
Italy	49	46	46	33	44	38	43	33	27	30	61	53	49	54	64	53	77
Netherlands	37	37	44	41	41	36	34	27	39	37	42	40	58	60	65	75	69
Spain	11	10	11	10	6	5	9	5	10	5	10	9	15	8	14	18	13
Sweden	38	52	40	42	29	27	37	26	35	23	45	44	49	54	61	53	60
United Kingdom	92	96	83	84	87	67	72	81	72	59	101	83	104	112	129	136	132
All others	9	3	2	3	6	4	4	3	5	2	6	7	9	7	12	16	14
Other Europe	73	73	80	64	55	39	50	44	45	52	57	74	86	94	110	98	101
Former Soviet Union	2	3	2	1	1	1	2	0	2	1	1	0	3	2	1	2	1
Norway	10	14	18	10	13	9	7	12	9	12	11	14	18	17	19	20	20
Russia	11	9	15	12	8	5	10	7	6	7	10	9	14	18	21	13	13
Switzerland	48	45	43	41	32	24	29	23	28	30	32	49	49	54	65	61	62
All others	3	1	2	1	1	0	1	2	1	1	2	2	3	3	3	2	5
Asia	482	547	528	523	471	412	416	434	461	492	708	682	715	805	874	992	1,061
China	14	14	17	11	18	13	24	19	20	28	46	61	73	81	94	123	147

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	10	9	7	9	12	11	14	15	9	8	10	11	6	13	28	33	44
Japan	364	396	392	370	344	290	278	294	301	316	464	437	452	482	488	548	572
Malaysia	1	0	0	1	1	1	0	2	1	0	0	2	3	3	2	1	2
Singapore	1	3	5	6	3	5	2	3	4	4	6	9	10	12	14	12	16
South Korea	24	33	28	33	28	36	38	37	62	72	100	98	102	127	146	185	190
Taiwan	67	90	76	90	65	53	60	64	63	63	81	65	67	84	99	85	87
All others	2	2	3	3	0	3	1	0	1	0	0	1	1	3	3	4	3
Middle East	23	20	21	18	14	13	9	10	9	10	20	17	34	44	56	61	67
Israel	16	18	17	15	11	11	7	8	7	8	14	13	16	25	25	29	31
All others	7	2	3	3	2	2	2	2	1	2	6	4	18	20	31	32	36
Africa	8	6	9	10	9	5	7	7	5	8	5	7	8	11	6	9	8
South Africa	7	5	9	10	8	5	4	6	5	7	4	6	7	9	6	8	7
All others	1	1	0	0	1	0	2	1	0	1	0	0	1	2	1	1	2
Australia and Oceania	30	24	30	24	26	32	28	26	24	12	33	39	43	48	53	52	45
Australia	29	20	23	21	19	27	24	23	20	12	31	34	41	43	49	47	39
New Zealand	1	3	7	3	6	5	3	3	4	1	2	5	2	4	5	5	6
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-18

USPTO patents granted in measurement, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	6,838	7,283	7,934	8,580	8,352	7,497	8,958	8,701	8,838	8,851	10,248	9,823	10,694	11,496	12,146	12,393	13,124
North America	4,035	4,193	4,439	4,852	4,704	4,215	5,060	4,740	4,729	4,639	5,125	4,983	5,240	5,541	5,739	5,831	6,168
Canada	124	138	139	162	172	135	150	161	158	164	186	188	205	239	245	230	269
Mexico	0	2	3	8	8	8	9	6	3	3	3	2	2	3	4	6	7
Puerto Rico	0	1	0	2	1	1	1	0	1	0	1	1	2	1	1	0	2
United States	3,910	4,053	4,297	4,680	4,522	4,071	4,901	4,573	4,566	4,472	4,936	4,792	5,031	5,299	5,490	5,593	5,889
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	4	7	3	7	5	4	10	11	10	8	14	11	15	16	18	18	15
Argentina	1	1	0	3	2	0	1	2	2	2	5	5	3	2	6	2	3
Brazil	2	3	2	3	1	2	4	6	7	3	7	4	8	8	9	10	8
All others	1	3	2	1	3	1	6	2	1	3	2	2	4	6	3	6	3
Europe	1,287	1,419	1,590	1,700	1,607	1,445	1,678	1,670	1,699	1,660	2,114	2,038	2,317	2,650	2,919	2,902	3,129
EU	1,161	1,284	1,423	1,517	1,435	1,287	1,496	1,479	1,467	1,433	1,826	1,798	2,025	2,329	2,575	2,508	2,687
Austria	16	17	28	25	30	23	35	31	29	31	46	50	46	67	71	84	112
Belgium	11	16	18	15	14	16	17	24	20	13	18	28	31	32	52	41	41
Denmark	12	11	12	16	20	20	26	21	13	16	24	30	24	26	38	36	37

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	39	26	43	50	47	34	43	43	48	50	65	43	55	53	67	61	76
France	175	177	165	191	155	160	184	197	213	185	251	263	307	383	409	416	427
Germany	539	621	707	788	728	654	732	729	717	669	836	799	895	993	1,079	1,040	1,089
Hungary	1	3	1	2	2	2	1	1	2	2	1	1	2	3	5	4	4
Ireland	8	2	6	13	10	3	10	13	8	13	17	11	10	17	21	15	26
Italy	44	62	58	62	63	46	55	62	59	53	74	85	83	119	119	125	119
Netherlands	52	51	66	66	57	46	56	57	73	72	77	92	107	117	149	143	150
Spain	6	4	9	3	3	9	10	7	15	17	13	23	25	24	29	27	30
Sweden	68	76	77	66	54	56	74	65	59	56	74	75	86	94	118	96	116
United Kingdom	182	213	219	208	240	209	234	215	197	235	304	274	327	360	386	379	417
All others	8	6	15	12	11	9	19	14	15	22	25	22	28	38	32	41	42
Other Europe	127	135	167	182	172	157	182	191	231	227	288	241	292	321	344	394	442
Former Soviet Union	1	1	2	3	2	2	4	5	5	3	2	4	6	5	3	2	9
Norway	15	15	20	31	28	31	32	33	54	42	60	60	57	66	70	83	68
Russia	10	21	20	22	13	9	17	19	14	19	23	16	23	30	38	27	35
Switzerland	95	95	120	123	129	114	125	132	152	161	200	158	199	214	223	273	322
All others	4	2	4	4	0	1	5	3	6	3	4	3	7	6	9	9	8
Asia	1,415	1,555	1,787	1,908	1,908	1,721	2,072	2,130	2,246	2,381	2,803	2,610	2,909	3,050	3,225	3,363	3,530
China	9	10	17	16	30	30	41	59	93	131	175	154	205	216	265	297	344

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	2	1	8	12	16	15	13	34	35	25	30	33	51	78	94	101	94
Japan	1,190	1,300	1,498	1,611	1,569	1,342	1,665	1,637	1,687	1,757	2,027	1,832	1,964	2,069	2,138	2,103	2,140
Malaysia	4	2	3	6	6	7	21	25	24	19	18	12	12	11	9	16	14
Singapore	15	19	22	24	19	20	13	19	23	17	22	20	27	23	29	31	44
South Korea	79	87	95	90	111	133	147	175	190	206	247	257	315	319	335	466	511
Taiwan	115	133	136	144	153	172	171	178	192	223	280	301	330	331	347	341	374
All others	0	3	8	4	3	2	1	2	3	2	5	1	5	4	7	6	9
Middle East	60	70	80	68	70	67	85	83	99	97	119	105	137	138	150	194	194
Israel	60	69	76	64	69	59	80	76	93	90	110	90	115	113	110	148	142
All others	1	1	4	3	1	8	5	7	6	7	10	15	23	25	39	47	52
Africa	5	3	2	1	4	2	5	8	3	3	1	3	4	11	10	8	10
South Africa	5	3	2	1	3	0	5	5	2	2	1	1	1	4	5	3	7
All others	0	1	0	0	1	2	0	3	1	1	0	2	3	7	5	5	3
Australia and Oceania	31	35	32	44	53	43	48	61	52	63	71	73	71	90	84	77	79
Australia	23	28	26	37	46	35	44	54	43	53	63	62	55	69	67	59	62
New Zealand	8	8	7	6	7	8	4	7	9	11	8	11	15	21	18	18	17
All others	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-19

USPTO patents granted in optics, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	7,596	7,898	8,165	9,018	9,633	8,459	9,695	8,787	9,007	9,357	11,188	11,048	11,137	11,611	12,422	12,354	12,088
North America	2,768	3,018	3,167	3,509	3,555	3,138	3,324	2,890	2,725	2,590	2,953	2,620	2,673	2,773	2,926	2,884	2,954
Canada	93	90	107	136	125	104	112	100	104	110	132	126	129	121	144	128	140
Mexico	0	1	4	2	1	2	1	2	1	1	0	1	4	3	5	5	6
Puerto Rico	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
United States	2,674	2,926	3,056	3,371	3,429	3,032	3,211	2,787	2,620	2,479	2,821	2,493	2,540	2,648	2,777	2,751	2,808
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	2	3	2	1	2	1	2	0	1	1	1	1	2	4	3	5	4
Argentina	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Brazil	2	2	1	1	0	0	2	0	1	1	1	0	0	3	2	2	3
All others	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	3	1
Europe	798	861	822	938	1,004	817	971	835	919	827	946	866	898	1,044	1,113	1,110	1,099
EU	753	806	769	881	927	753	913	793	869	785	888	820	857	978	1,049	1,040	1,030
Austria	13	13	10	10	12	9	14	8	8	6	14	16	13	13	16	17	18
Belgium	83	62	43	43	32	20	30	20	20	13	24	18	18	23	31	30	39
Denmark	4	8	6	12	16	11	6	13	9	13	10	9	6	10	10	15	11

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	3	8	3	5	9	11	7	15	9	13	21	9	11	12	12	18	20
France	111	121	92	128	115	81	81	66	58	77	95	93	112	123	130	125	119
Germany	260	304	325	363	393	342	353	293	339	294	331	314	343	395	417	425	406
Hungary	0	2	0	1	2	1	4	3	3	0	3	3	0	2	2	3	3
Ireland	1	1	2	4	4	7	4	2	6	4	4	5	2	4	5	5	4
Italy	25	38	24	47	43	32	34	31	22	35	24	27	31	32	22	30	35
Netherlands	48	49	66	74	104	86	210	211	254	212	218	191	174	204	236	214	209
Spain	2	5	1	2	2	2	4	5	4	4	3	4	8	9	6	8	10
Sweden	41	34	31	29	37	26	32	29	26	26	29	29	22	26	30	30	21
United Kingdom	163	157	162	160	152	118	123	89	97	83	105	94	107	113	121	101	123
All others	1	4	3	2	4	6	10	8	14	4	6	7	9	11	12	15	12
Other Europe	45	54	53	58	78	64	58	41	50	41	57	46	40	66	64	71	70
Former Soviet Union	0	2	1	2	3	1	3	1	1	0	3	2	0	0	2	3	3
Norway	1	0	4	4	6	8	5	4	4	1	3	2	5	4	8	2	3
Russia	5	10	8	8	15	17	15	7	10	6	13	7	7	13	10	12	12
Switzerland	37	41	40	43	53	38	34	28	32	33	36	35	28	47	45	51	47
All others	1	0	0	1	0	0	1	0	2	1	2	1	0	1	0	2	4
Asia	3,984	3,953	4,108	4,484	4,994	4,443	5,309	4,989	5,286	5,858	7,189	7,472	7,483	7,697	8,276	8,243	7,914
China	11	15	22	30	36	27	28	40	48	51	92	126	141	210	388	538	688

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	1	0	2	3	1	6	0	6	4	2	2	7	4	11	7	9	13
Japan	3,561	3,471	3,556	3,779	4,109	3,532	4,163	3,827	3,854	4,239	5,175	5,437	5,480	5,688	5,983	5,821	5,409
Malaysia	2	1	2	0	1	5	1	4	5	4	3	2	2	1	5	4	2
Singapore	6	8	8	11	20	23	12	12	13	13	22	17	17	14	13	27	22
South Korea	266	285	307	388	506	549	692	713	890	938	1,165	1,153	1,070	1,006	1,073	1,036	1,039
Taiwan	139	174	211	273	319	301	412	384	472	609	727	727	767	764	805	803	736
All others	0	0	0	0	2	0	0	2	0	0	2	3	2	4	3	5	6
Middle East	27	48	47	64	47	40	50	47	50	59	69	49	65	69	79	82	94
Israel	27	47	47	63	46	39	50	47	50	57	69	48	63	68	76	76	88
All others	1	1	0	1	1	0	0	0	0	1	1	1	2	1	3	6	5
Africa	0	0	0	1	1	2	0	1	0	0	1	2	0	1	3	4	1
South Africa	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	0
All others	0	0	0	1	1	1	0	1	0	0	1	2	0	1	3	2	0
Australia and Oceania	16	15	18	21	28	19	38	24	25	22	30	37	17	23	21	27	20
Australia	15	15	17	18	28	17	36	23	23	20	25	36	15	18	20	22	16
New Zealand	1	0	1	3	0	2	2	1	2	2	5	1	2	4	1	4	4
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-20

USPTO patents granted in analysis of biological materials, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	852	958	880	874	866	707	954	980	1,010	1,029	1,519	1,519	1,522	1,697	1,722	1,747	1,757
North America	572	658	593	606	597	498	639	663	656	668	965	951	939	1,021	989	1,022	1,019
Canada	33	36	31	38	34	19	34	35	33	28	47	44	48	47	39	51	45
Mexico	0	0	0	0	2	0	0	0	0	1	1	1	0	1	2	2	1
Puerto Rico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
United States	539	622	562	568	562	478	605	628	623	639	917	905	891	973	948	969	972
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	2	3	2	3	4	2	4	1	1	1	1	3	3	6	6	5	3
Argentina	1	0	0	0	1	0	1	0	0	0	0	1	0	0	2	1	1
Brazil	0	1	0	2	2	1	2	0	1	1	0	2	2	2	3	1	1
All others	1	2	2	0	0	2	1	1	0	0	0	0	1	3	1	4	1
Europe	192	190	183	177	165	125	179	184	177	189	300	298	295	353	401	363	366
EU	181	176	173	166	150	118	170	172	164	176	284	280	269	329	374	334	330
Austria	3	4	4	3	3	1	1	4	3	3	8	5	11	9	11	9	7
Belgium	4	4	3	10	6	3	10	8	9	9	11	14	9	10	19	14	14
Denmark	8	6	10	9	6	6	4	5	4	1	8	10	8	11	11	11	9

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	6	10	10	5	4	5	5	2	5	6	9	6	10	5	6	11	9
France	30	23	25	22	18	22	33	25	29	26	41	38	38	54	64	55	58
Germany	58	67	57	54	53	31	52	54	47	66	109	102	90	114	109	98	97
Hungary	0	1	0	0	0	0	1	0	1	0	1	0	1	1	2	1	1
Ireland	2	2	2	1	1	0	3	1	0	0	1	2	2	5	2	3	2
Italy	5	3	4	6	4	3	4	4	7	6	10	12	11	13	17	13	15
Netherlands	9	6	4	8	8	5	3	8	9	11	13	14	12	12	22	24	15
Spain	1	1	2	3	1	1	1	3	6	6	3	3	4	4	7	9	11
Sweden	16	11	14	11	13	10	11	17	11	11	16	21	20	17	26	17	25
United Kingdom	37	37	37	33	31	31	41	40	33	29	51	49	49	67	73	66	60
All others	1	1	0	0	1	1	1	1	1	2	4	4	2	7	6	3	7
Other Europe	12	13	11	10	15	7	9	13	13	13	16	19	26	23	27	30	36
Former Soviet Union	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0
Norway	2	4	1	2	3	2	0	4	4	4	1	4	8	5	5	5	6
Russia	1	1	1	4	1	0	0	2	2	1	3	1	1	4	3	3	4
Switzerland	6	7	8	4	11	4	7	6	6	7	11	14	15	14	17	20	24
All others	2	1	0	0	0	0	1	0	1	1	1	0	1	0	2	2	2
Asia	68	87	82	72	84	70	107	112	154	144	223	237	252	272	285	304	313
China	0	2	2	2	2	0	2	4	9	6	18	12	25	18	27	26	30

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	1	2	2	3	1	2	3	1	3	4	5	4	4	10	8	6	10
Japan	59	73	69	56	67	58	92	93	114	107	154	170	175	167	166	177	180
Malaysia	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	1	1
Singapore	0	2	0	2	0	1	1	0	3	1	1	2	5	8	13	9	11
South Korea	4	1	2	3	3	3	6	8	10	13	26	28	26	36	42	52	55
Taiwan	3	6	5	5	10	5	3	5	15	11	18	20	18	31	29	33	24
All others	0	1	0	0	0	0	0	0	0	1	0	0	0	2	0	1	1
Middle East	9	10	8	8	5	6	13	7	13	14	15	15	17	28	17	32	35
Israel	8	10	8	8	4	6	12	6	11	14	14	14	14	25	11	27	25
All others	1	0	0	0	1	0	2	1	1	1	1	1	3	3	6	5	10
Africa	1	0	1	0	1	0	2	0	1	1	1	1	1	1	0	1	1
South Africa	1	0	1	0	1	0	2	0	0	0	1	0	1	1	0	1	1
All others	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0
Australia and Oceania	7	10	11	9	10	7	9	12	8	12	13	14	15	17	24	19	20
Australia	7	9	9	9	7	4	8	10	8	10	11	12	13	15	18	17	17
New Zealand	1	1	2	0	3	2	1	2	1	2	2	2	1	2	6	2	2
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-21

USPTO patents granted in control, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	2,662	2,645	2,654	2,842	2,987	2,667	3,370	2,825	2,834	2,897	3,793	3,931	4,807	5,302	5,665	5,428	5,849
North America	1,623	1,595	1,589	1,760	1,858	1,630	2,101	1,735	1,796	1,826	2,387	2,495	2,932	3,339	3,495	3,263	3,525
Canada	56	54	63	44	61	49	66	45	58	56	79	82	85	133	137	113	120
Mexico	1	0	2	1	1	2	2	0	0	3	2	3	3	1	2	2	3
Puerto Rico	1	0	0	1	0	1	1	1	1	1	1	0	1	0	1	1	3
United States	1,565	1,541	1,524	1,714	1,796	1,579	2,033	1,689	1,737	1,767	2,305	2,410	2,843	3,205	3,355	3,147	3,399
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central and South America	4	3	1	5	6	3	9	3	2	4	6	9	10	8	8	13	13
Argentina	1	1	1	1	1	0	2	0	0	1	1	0	1	1	3	3	1
Brazil	3	1	0	2	3	2	5	1	0	2	3	6	8	4	4	9	9
All others	0	1	0	2	2	1	2	3	2	1	2	3	2	3	1	1	2
Europe	397	409	440	425	425	421	473	377	412	382	511	528	698	741	830	774	858
EU	376	378	414	404	404	398	445	353	387	362	476	493	656	690	774	722	801
Austria	13	10	3	10	10	6	10	5	11	11	12	15	25	29	32	29	37
Belgium	7	8	5	2	3	3	3	4	5	3	6	4	8	6	9	7	13
Denmark	5	1	5	6	4	4	6	1	2	4	4	7	4	8	11	6	10

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	5	8	7	3	8	5	12	10	5	7	7	10	5	16	19	12	23
France	51	45	64	58	55	55	48	48	61	55	93	94	139	147	148	118	123
Germany	150	164	174	189	195	194	217	145	166	155	198	181	250	244	278	274	276
Hungary	0	0	0	0	0	1	2	0	1	0	0	0	0	0	1	1	2
Ireland	2	2	3	2	2	4	8	6	4	11	7	6	4	4	11	10	13
Italy	26	29	22	23	19	19	23	16	20	15	17	21	38	34	46	42	46
Netherlands	17	15	13	12	13	11	16	11	15	11	11	13	18	25	21	24	32
Spain	6	5	8	4	5	4	2	2	5	5	7	5	8	15	18	20	13
Sweden	22	19	16	18	19	18	25	23	16	14	21	27	33	33	35	39	44
United Kingdom	71	70	87	74	68	73	73	76	69	68	90	101	104	107	122	109	140
All others	1	3	7	3	2	3	3	6	7	3	3	9	19	21	23	31	28
Other Europe	21	32	26	21	22	23	28	25	24	20	36	35	42	51	56	52	56
Former Soviet Union	3	2	1	0	0	1	1	0	0	0	0	0	1	1	1	1	0
Norway	4	4	5	2	4	2	7	7	5	3	7	8	9	9	9	9	8
Russia	2	3	2	3	1	4	3	2	2	2	3	2	3	5	6	5	8
Switzerland	12	23	18	16	16	15	17	15	17	14	25	24	27	33	38	34	36
All others	1	0	1	0	0	0	1	0	1	0	2	1	2	3	2	3	3
Asia	597	591	583	600	638	566	726	641	570	621	794	794	1,016	1,042	1,150	1,204	1,290
China	2	4	10	5	6	7	11	21	20	16	38	39	50	55	96	103	111

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	1	2	4	1	6	6	7	7	7	13	17	26	20	48	64	56	82
Japan	485	491	487	484	510	438	565	483	419	441	560	540	703	706	682	702	732
Malaysia	1	0	0	0	0	0	0	2	0	1	1	1	1	3	3	2	2
Singapore	5	3	3	4	5	7	3	3	5	8	9	10	7	7	8	17	19
South Korea	53	55	32	50	43	43	49	59	48	67	75	94	95	107	150	183	201
Taiwan	50	37	47	54	67	65	88	66	70	74	89	82	138	115	140	140	136
All others	0	0	0	1	1	1	4	0	0	1	6	1	2	1	7	3	7
Middle East	20	20	17	23	25	16	25	26	18	24	29	37	32	42	62	70	63
Israel	17	19	16	23	23	15	22	23	17	23	25	30	26	31	48	56	51
All others	3	1	1	1	2	1	3	3	1	1	4	7	7	11	14	14	12
Africa	1	7	5	3	3	2	3	3	2	3	4	3	7	9	7	8	8
South Africa	1	6	5	3	3	2	3	3	2	3	4	3	6	8	4	6	5
All others	0	1	0	0	0	0	0	0	0	0	0	1	1	1	3	1	3
Australia and Oceania	21	18	20	26	32	29	33	40	34	37	61	63	112	118	111	96	93
Australia	20	16	17	25	29	26	30	35	32	34	58	61	107	114	107	88	88
New Zealand	1	2	3	1	3	3	2	5	2	3	3	2	4	4	4	8	5
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	1	1	0	0	0	0	0	0	1	0	1	2	0	3	1	1	1

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-22

USPTO patents granted in materials and metallurgy, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	2,093	2,373	2,401	2,315	2,043	1,584	1,607	1,458	1,364	1,682	2,341	2,333	2,524	2,654	2,778	2,805	2,752
North America	938	1,031	1,017	1,008	886	697	735	663	608	744	1,012	965	997	1,081	1,109	1,045	1,010
Canada	52	57	70	62	50	39	44	33	33	39	52	49	50	55	57	48	52
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	10	2	6	4	2	0	4	3	2	5	6	7	6	8	8	4	5
United States	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	1
All others	877	972	941	941	833	657	687	626	573	700	953	909	941	1,019	1,043	993	952
Central and South America	9	10	9	10	6	2	6	7	6	9	9	15	13	10	21	18	16
Argentina	0	1	0	1	0	0	0	0	0	0	0	1	2	0	3	2	1
Brazil	2	3	2	4	2	0	3	3	2	5	5	8	5	6	11	13	11
All others	7	5	7	4	4	2	3	4	4	4	5	7	5	3	6	4	4
Europe	553	626	616	547	488	384	359	322	301	347	499	491	550	569	605	627	610
EU	507	583	564	498	445	359	331	300	277	322	466	454	501	528	559	579	552
Austria	19	34	30	29	19	17	16	17	8	14	21	20	23	22	26	25	29
Belgium	15	17	23	13	20	12	14	8	10	15	23	15	16	18	28	26	26
Denmark	11	12	14	8	12	10	10	4	4	7	8	7	7	7	9	8	6

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	5	11	8	9	15	9	6	5	4	10	17	6	8	12	9	16	13
France	110	120	96	85	66	65	52	56	55	63	90	87	127	110	116	126	111
Germany	226	235	228	208	199	158	136	122	102	132	182	190	203	223	224	205	204
Hungary	1	1	1	1	1	0	0	1	1	0	1	1	0	2	1	1	1
Ireland	0	0	1	1	1	0	0	1	1	2	1	2	1	3	1	3	1
Italy	29	30	35	28	20	19	21	14	16	10	26	24	19	22	29	33	34
Netherlands	15	15	16	16	19	15	11	10	17	18	17	23	15	21	23	17	16
Spain	6	4	8	9	4	4	6	2	4	4	4	7	7	7	10	7	10
Sweden	24	45	48	33	26	19	20	29	26	21	29	25	24	27	25	36	26
United Kingdom	42	47	45	53	39	25	34	27	24	22	36	41	40	42	45	60	58
All others	4	11	11	6	3	7	3	6	6	3	10	7	10	11	13	16	16
Other Europe	46	43	52	48	43	25	27	22	24	25	33	37	49	41	45	48	58
Former Soviet Union	1	2	3	4	0	3	1	0	0	1	1	2	1	0	2	2	2
Norway	8	5	6	6	10	5	4	4	7	2	7	5	8	8	9	9	9
Russia	6	9	11	9	12	7	7	5	4	7	9	6	3	8	8	7	10
Switzerland	29	26	31	26	20	10	14	12	10	14	14	21	33	23	26	27	30
All others	1	1	1	3	0	0	2	1	3	1	1	3	3	2	1	3	6
Asia	558	664	721	712	624	475	468	438	422	541	761	805	909	933	975	1,043	1,053
China	5	4	7	2	8	3	6	11	9	20	32	32	57	63	87	91	96

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	5	4	8	8	15	9	11	11	10	6	10	8	16	17	19	22	19
Japan	499	580	639	634	534	415	395	362	357	435	611	632	683	680	695	720	712
Malaysia	0	0	0	0	3	1	2	1	1	0	1	1	1	1	2	0	0
Singapore	1	1	3	4	4	2	2	1	1	3	2	2	2	3	3	6	11
South Korea	34	56	41	44	37	33	33	32	26	52	72	99	101	120	127	156	171
Taiwan	14	17	22	19	22	12	18	21	17	26	32	30	46	46	39	45	40
All others	0	2	0	1	1	1	0	1	1	0	1	2	3	4	3	4	3
Middle East	9	7	6	6	6	5	9	6	8	9	11	14	20	23	29	29	36
Israel	8	6	5	5	6	5	8	5	7	6	7	8	8	8	12	6	10
All others	1	2	1	1	0	0	1	1	1	3	4	6	13	15	16	23	26
Africa	4	10	6	6	8	6	10	3	3	6	9	9	8	12	8	11	5
South Africa	3	10	6	6	7	6	9	3	3	6	9	8	8	12	8	10	5
All others	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0
Australia and Oceania	21	25	26	27	24	15	21	19	16	25	40	35	27	25	31	32	23
Australia	20	23	26	26	23	15	20	18	16	24	38	33	24	24	30	30	21
New Zealand	2	2	0	2	1	1	0	1	1	1	1	2	3	0	1	2	2
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-23

USPTO patents granted in microstructural and nanotechnology, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	484	595	696	905	1,032	966	1,134	1,039	1,060	1,145	1,493	1,458	1,410	1,551	1,668	1,457	1,245
North America	246	321	378	516	580	558	626	572	583	582	713	678	663	741	794	694	588
Canada	5	5	2	15	15	14	16	12	17	11	22	22	22	20	24	22	19
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0
United States	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0
All others	240	316	376	501	565	545	610	559	565	570	689	656	641	719	769	671	568
Central and South America	0	0	0	0	0	1	0	0	0	0	1	1	2	1	2	1	1
Argentina	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Brazil	0	0	0	0	0	1	0	0	0	0	1	1	1	1	2	1	0
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Europe	52	61	76	89	103	103	118	114	112	128	205	210	210	239	248	242	211
EU	45	54	69	78	91	94	105	106	98	120	187	189	195	222	227	224	191
Austria	1	0	0	0	1	2	2	2	3	2	6	5	6	5	2	7	4
Belgium	0	1	2	1	4	1	3	2	3	5	8	10	10	12	8	9	6
Denmark	0	0	1	2	1	2	1	2	3	2	1	1	1	2	2	3	3

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	0	0	1	1	2	2	1	1	0	2	2	4	5	4	2	4	5
France	10	10	12	13	14	15	13	14	13	18	46	42	40	38	46	44	35
Germany	17	21	27	39	37	41	47	48	41	45	64	63	74	82	87	85	68
Hungary	0	0	0	0	0	0	0	0	0	1	0	2	1	0	0	1	1
Ireland	0	1	1	1	1	0	2	0	1	1	2	1	2	4	3	1	1
Italy	1	3	4	2	5	3	7	8	8	5	10	14	7	13	13	16	14
Netherlands	1	6	6	5	5	6	9	11	10	14	20	16	22	25	24	15	20
Spain	1	2	2	1	1	0	0	0	1	1	2	2	1	4	5	5	4
Sweden	5	2	3	4	5	4	2	4	4	5	7	8	10	7	7	9	6
United Kingdom	8	6	10	10	14	16	15	12	10	17	17	15	14	21	25	22	19
All others	0	0	1	0	1	2	2	2	1	1	2	5	2	5	2	4	7
Other Europe	6	7	7	10	12	9	13	8	14	9	18	21	15	17	21	18	20
Former Soviet Union	0	0	0	1	0	0	0	1	0	0	0	1	1	1	1	1	0
Norway	1	1	1	0	2	0	2	0	1	1	1	1	1	0	1	1	0
Russia	2	2	2	2	2	2	2	2	3	2	2	2	2	4	4	3	4
Switzerland	4	4	3	6	7	7	8	5	9	6	14	15	11	11	15	13	14
All others	0	0	0	1	1	0	1	0	1	0	0	1	1	1	1	1	2
Asia	180	195	233	289	337	290	370	334	352	415	557	547	519	545	595	495	423
China	0	0	1	1	3	3	8	7	7	17	23	22	29	47	65	59	58

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	0	0	1	1	2	1	2	2	1	2	1	2	4	6	8	9	6
Japan	164	175	198	246	270	232	278	242	239	279	364	358	314	302	302	213	172
Malaysia	0	0	0	0	1	1	1	0	1	1	0	0	0	1	1	1	1
Singapore	1	1	2	5	3	3	3	5	4	4	6	4	8	6	13	11	14
South Korea	6	13	20	27	39	34	51	42	64	81	113	114	92	103	113	109	86
Taiwan	10	5	12	9	19	15	27	36	34	31	50	46	70	78	94	92	85
All others	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1
Middle East	3	5	2	6	5	3	3	5	5	8	7	9	11	17	17	16	15
Israel	3	4	2	5	5	3	3	4	5	7	7	7	7	12	12	8	11
All others	0	0	0	0	0	0	0	0	0	1	0	2	4	5	5	8	4
Africa	0	0	0	0	0	0	0	1	0	0	0	1	0	3	2	1	1
South Africa	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0
All others	0	0	0	0	0	0	0	1	0	0	0	0	0	1	2	0	1
Australia and Oceania	2	14	7	6	7	10	16	13	7	12	11	13	5	5	10	8	6
Australia	2	14	7	6	7	10	16	13	7	11	10	12	5	4	9	7	5
New Zealand	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-24

USPTO patents granted in surface technology and coating, by region, country, or economy: 2000–16

(Number)

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	2,502	2,651	2,676	2,617	2,470	1,913	1,760	1,656	1,576	1,564	2,222	2,299	2,596	2,753	2,913	3,019	3,153
North America	1,326	1,421	1,394	1,410	1,269	1,043	905	863	802	813	1,066	1,074	1,217	1,266	1,258	1,319	1,359
Canada	35	41	42	39	34	30	29	28	21	18	21	35	52	39	40	40	52
Mexico	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Puerto Rico	0	1	0	0	3	0	1	1	1	1	0	0	1	2	1	2	3
United States	0	1	0	2	0	0	1	0	0	0	0	0	0	2	0	0	0
All others	1,291	1,378	1,352	1,369	1,232	1,013	875	833	781	795	1,045	1,039	1,164	1,223	1,216	1,277	1,304
Central and South America	3	3	7	7	8	1	2	4	3	2	3	4	5	11	4	8	5
Argentina	0	0	0	0	2	0	0	0	0	0	0	1	1	1	0	0	0
Brazil	0	1	0	1	0	0	1	2	2	0	1	1	1	4	2	5	3
All others	3	2	7	6	5	1	1	2	1	2	2	3	3	6	2	3	2
Europe	391	480	462	444	402	303	309	253	252	219	394	416	446	470	499	574	588
EU	359	436	424	406	361	279	278	230	226	205	364	381	409	427	463	529	531
Austria	11	14	14	11	8	6	6	6	6	5	10	12	12	12	14	12	20
Belgium	11	17	17	13	8	12	8	10	8	11	17	20	17	16	20	24	25
Denmark	4	1	5	4	2	2	1	1	3	3	3	5	4	4	8	4	7

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Finland	5	13	11	15	19	11	17	9	10	15	12	10	7	15	11	15	19
France	52	60	51	57	50	30	35	33	26	36	52	43	57	63	73	78	79
Germany	169	210	201	204	182	140	130	97	96	81	159	159	165	184	212	234	224
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ireland	0	0	2	2	2	0	2	0	4	2	2	3	5	2	5	4	4
Italy	28	27	22	24	20	13	16	16	10	13	20	19	26	20	17	26	26
Netherlands	15	11	17	15	15	14	10	13	14	9	16	19	20	20	22	24	30
Spain	2	0	4	1	3	3	2	2	0	1	4	4	7	3	5	8	11
Sweden	23	31	27	21	24	21	25	15	21	11	22	36	37	28	23	22	21
United Kingdom	36	49	50	36	27	25	25	24	21	15	39	46	48	53	48	69	52
All others	2	4	4	5	2	3	3	3	7	3	7	4	5	7	4	8	12
Other Europe	32	44	38	38	41	23	31	23	27	13	30	35	37	43	37	45	57
Former Soviet Union	1	1	1	1	1	3	0	1	2	0	0	0	1	1	2	3	2
Norway	2	1	2	1	3	3	4	2	7	2	1	4	2	4	2	4	7
Russia	7	12	7	8	6	3	4	4	2	3	3	4	5	1	1	3	5
Switzerland	19	29	27	25	28	15	21	14	14	7	24	24	26	36	30	32	41
All others	2	1	1	3	3	0	2	2	1	1	2	2	2	2	2	2	2
Asia	766	726	791	738	767	554	532	518	506	515	738	781	906	983	1,122	1,092	1,166
China	2	4	4	3	4	6	6	6	4	7	25	20	34	50	62	60	91

Region, country, or economy	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	0	0	1	1	1	2	2	1	3	1	3	4	6	7	7	8	12
Japan	650	617	655	611	621	449	418	424	392	414	559	602	671	667	768	746	748
Malaysia	0	0	1	0	1	1	1	0	0	0	0	0	1	4	3	2	2
Singapore	4	7	8	8	7	6	5	4	2	3	5	4	4	4	6	6	12
South Korea	53	38	68	59	76	54	65	43	67	66	92	91	101	111	149	180	202
Taiwan	55	59	54	54	56	38	37	41	36	24	52	59	87	139	127	86	96
All others	1	0	0	2	1	0	0	0	1	0	1	1	1	1	1	3	3
Middle East	3	5	11	9	6	4	5	7	3	6	7	12	10	13	14	12	21
Israel	3	5	11	9	6	4	5	6	3	6	7	11	7	7	12	10	14
All others	0	0	1	1	0	0	1	1	0	0	0	1	3	6	2	3	7
Africa	4	3	1	0	1	0	0	0	0	0	3	0	4	1	2	2	3
South Africa	3	3	1	0	1	0	0	0	0	0	2	0	3	1	1	2	2
All others	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0
Australia and Oceania	10	12	10	9	16	8	5	11	10	9	11	11	9	9	13	13	12
Australia	9	11	9	9	14	8	5	11	9	7	10	10	9	9	11	11	11
New Zealand	1	1	1	0	2	0	0	1	2	2	1	1	0	0	2	2	1
All others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unclassified	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

EU = European Union; USPTO = U.S. Patent and Trademark Office.

Note(s)

Patents are allocated according to patent inventorship information. Patents are fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. The EU includes 28 member countries. China includes Hong Kong. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification.

Source(s)

Science-Metrix; PatentsView and USPTO patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-25

Patent activity indexes for selected technologies for selected economies: 2014–16

(Patent activity index)

Technology	United States	EU	Japan	South Korea	Taiwan	China
ICT						
Basic communication processes	0.87	0.99	1.07	1.14	1.70	1.11
Computer	1.14	0.64	0.74	1.01	1.05	1.05
Digital communications	1.12	0.88	0.50	1.36	0.47	1.91
IT management	1.62	0.54	0.22	0.23	0.11	0.40
Semiconductors	0.64	0.58	1.51	2.46	3.52	1.11
Telecommunications	0.93	0.81	1.19	1.34	0.98	1.41
Testing, measuring, and control						
Analysis of biological materials	1.17	1.34	0.58	0.48	0.43	0.50
Control	1.24	0.91	0.72	0.53	0.64	0.58
Measurement	0.95	1.39	0.97	0.58	0.74	0.76
Optics	0.48	0.57	2.69	1.43	1.66	1.38
Chemistry and health						
Pharmaceuticals	1.19	1.35	0.34	0.37	0.40	0.71
Biotechnology	1.17	1.41	0.48	0.48	0.33	0.61
Basic material chemistry	0.98	1.34	1.01	0.50	0.30	0.79
Organic chemistry	0.96	1.74	0.63	0.47	0.31	1.21
Macromolecular chemistry	0.80	1.52	1.34	1.00	0.44	0.74
Chemical engineering	1.01	1.55	0.68	0.64	0.52	0.84
Medical technology	1.40	1.02	0.42	0.22	0.25	0.25
Materials and nanotechnology						
Materials and metallurgy	0.76	1.36	1.47	0.91	0.39	1.04
Microstructural and nanotechnology	0.97	0.99	0.90	1.18	1.62	1.32
Surface technology and coating	0.88	1.13	1.43	0.98	0.89	0.74

EU = European Union; ICT = information and communications technologies; IT = information technology.

Note(s)

Patents are allocated according to patent inventorship information. A patent activity index is the ratio of a country's share of a technology to its share of all patents. A patent activity index greater than 1.00 indicates that the country is relatively more concentrated in the technology area. An index less than 1.00 indicates that the economy is relatively less concentrated in the technology area. The EU includes 28 member countries. China includes Mainland China, Hong Kong, and Macau. Patents are classified under the World Intellectual Property Organization (WIPO) classification of patents, which classifies International Patent Classification (IPC) codes under 35 technical fields. IPC reformed codes take into account changes that were made to the WIPO classification in 2006 under the eighth version of the classification and were used to prepare these data. However, because PatentsView only provides the original IPC codes as they appeared on patents and not the IPC reformed codes, current Cooperative Patent Classification codes on patents were converted back to the most recent IPC classification to prepare these statistics. Fractional counts of patents were assigned to each technological field on patents to assign the proper weight of a patent to the corresponding technological fields under the classification. For instance, a patent that is classified under five different technological fields will see each of its technological fields receive a 0.2 count of the patent so that the patent accounts for a count of 1.0 across all technological fields. Patents are also fractionally allocated among regions, countries, or economies based on the proportion of residences of all named inventors. As such, data across regions, countries, or economies add up to the world total.

Source(s)

Science-Metrix; PatentsView and U.S. Patent and Trademark Office patent data, accessed April 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-26

Academic patenting and licensing activities: 2001–15

(Millions of current dollars and number)

Activity indicator	2001 (139)	2002 (156)	2003 (165)	2004 (164)	2005 (159)	2006 (161)	2007 (161)	2008 (159)	2009 (153)	2010 (155)	2011 (157)	2012 (155)	2013 (162)	2014 (155)	2015 (165)
Current $millions															
Net royalties[a]	753.8	868.9	866.8	924.9	1,588.1	1,322.3	1,898.8	2,127.1	1,474.6	1,480.5	1,486.0	1,708.4	1,816.1	2,038.4	1,760.0
Gross royalties[a]	868.3	997.8	1,033.6	1,088.5	1,775.0	1,511.6	2,098.8	2,397.2	1,782.1	1,790.1	1,814.0	1,955.3	2,089.9	2,223.4	1,946.0
Royalties paid to others	41.0	38.8	65.5	54.4	67.8	67.8	63.7	114.8	153.2	164.4	175.5	87.6	92.2	103.0	143.5
Unreimbursed legal fees expended	73.5	90.1	101.3	109.2	119.1	121.5	136.3	155.3	154.3	145.2	152.5	159.3	181.6	185.0	186.0
Number															
Invention disclosures received	11,259	12,638	13,718	15,002	15,371	16,855	17,677	17,694	18,163	18,635	19,732	21,353	21,596	21,717	22,507
New U.S. patent applications filed	5,784	6,509	7,203	9,462	9,306	10,748	10,899	11,197	11,222	11,075	12,090	13,034	13,573	12,696	13,389
U.S. patents granted	3,179	3,109	3,450	3,268	2,944	2,895	3,291	2,933	3,088	4,018	4,296	4,635	5,220	5,898	6,164
Startup companies formed	402	364	348	425	418	500	510	549	555	613	617	655	759	853	950
Operational startups	1,904	2,070	2,090	2,451	2,652	2,960	3,148	3,076	3,175	3,339	3,573	3,747	3,948	4,419	4,757
Active licenses	18,845	20,927	22,091	23,269	23,896	26,070	26,094	26,816	28,763	33,309	33,284	34,417	37,445	37,956	40,402
Revenue-generating licenses/ options	7,715	8,490	8,976	9,543	10,251	10,733	12,467	13,231	13,927	13,995	14,754	15,797	15,925	15,678	17,758
New licenses/ options executed[b]	3,300	3,739	3,855	4,087	4,201	4,192	4,419	4,416	4,624	4,735	5,398	5,567	5,865	6,190	7,157
Equity licenses/ options	328	373	316	318	278	357	377	382	354	357	387	445	428	495	603

[a] One-year spikes in royalty data reflect extraordinary one-time payments.

[b] Data before 2004 may not be comparable with data for 2004 and beyond due to changes in survey wording.

Note(s)

The number of institutions reporting is given in parentheses. Data from nonuniversity hospitals and medical institutes are not included. Responding institutions may report for any 12-month period ending in the identified year.

Source(s)

Association of University Technology Managers (AUTM), AUTM Licensing Survey (various years).

Science and Engineering Indicators 2018

APPENDIX TABLE 8-27

Federal technology transfer activity indicators for U.S. agencies with federal laboratories: FYs 2001–14

(Number)

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Invention disclosures and patenting														
All 11 agencies														
Inventions disclosed	3,962	4,149	5,106	5,454	4,771	5,193	4,732	4,572	4,452	4,755	5,251	5,350	5,321	5,103
Patent applications filed	2,175	2,130	2,318	1,768	1,745	1,912	1,847	1,952	1,957	2,002	2,308	2,361	2,494	2,609
Patents issued	1,610	1,511	1,631	1,391	1,012	1,284	1,380	1,253	1,319	1,468	1,449	2,228	1,855	1,931
USDA														
Inventions disclosed	118	151	121	142	125	105	126	100	143	149	158	160	191	117
Patent applications filed	83	90	60	81	88	83	114	123	123	113	124	122	157	119
Patents issued	64	53	64	50	27	39	37	30	24	45	49	69	65	83
DOC														
Inventions disclosed	26	17	21	25	21	14	32	40	41	31	26	52	41	47
Patent applications filed	12	12	5	12	12	5	8	21	20	20	17	21	26	25
Patents issued	21	20	9	12	10	7	3	3	7	12	16	13	16	18
DOD														
Inventions disclosed	1,005	1,122	1,332	1,369	534	1,056	838	1,018	831	698	929	1,078	1,032	963
Patent applications filed	809	829	810	517	354	691	597	590	690	436	844	1,013	942	916

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Patents issued	619	617	619	426	191	472	425	462	404	304	523	1,048	648	670
DOE														
Inventions disclosed	1,527	1,498	1,469	1,617	1,776	1,694	1,575	1,460	1,439	1,616	1,820	1,661	1,796	1,588
Patent applications filed	792	711	866	661	812	726	693	904	775	965	868	780	944	1,144
Patents issued	605	551	627	520	467	438	441	370	363	480	460	483	554	693
EPA														
Inventions disclosed	17	16	14	18	12	12	16	9	8	5	8	18	8	5
Patent applications filed	14	14	23	12	13	13	15	6	3	3	8	10	7	9
Patents issued	12	9	8	11	9	10	10	4	9	9	12	17	16	5
HHS														
Inventions disclosed	434	431	472	461	452	442	447	437	389	337	351	352	320	351
Patent applications filed	255	262	279	216	230	166	261	164	156	291	272	233	230	216
Patents issued	119	116	136	167	154	164	379	278	397	470	270	453	428	335
DHS														
Inventions disclosed	na	na	na	NA	NA	NA	NA	10	32	7	38	40	20	36
Patent applications filed	na	na	na	NA	NA	NA	NA	0	2	2	12	10	4	5
Patents issued	na	na	na	NA	NA	NA	NA	1	2	1	0	0	4	3
DOI														
Inventions disclosed	6	14	9	6	4	5	7	7	4	5	5	10	9	6

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Patent applications filed	17	12	8	6	3	2	5	7	8	7	2	3	8	4
Patents issued	7	13	5	9	9	5	6	1	4	5	1	3	4	2
NASA														
Inventions disclosed	696	775	1,485	1,612	1,678	1,749	1,514	1,324	1,412	1,735	1,723	1,642	1,618	1,683
Patent applications filed	152	166	231	207	202	142	127	122	141	150	130	131	146	146
Patents issued	159	128	155	189	133	85	68	90	93	130	111	129	116	117
DOT														
Inventions disclosed	2	0	0	0	4	3	2	3	3	1	2	2	13	3
Patent applications filed	3	0	0	2	5	3	2	2	2	2	2	1	5	0
Patents issued	0	0	0	0	2	0	3	4	1	4	0	4	1	1
VA														
Inventions disclosed	131	125	183	204	165	157	175	164	150	171	191	335	273	304
Patent applications filed	38	34	36	54	26	27	25	13	37	13	29	37	25	25
Patents issued	4	4	8	7	10	5	8	10	15	8	7	9	3	4
Licensing														
All 11 agencies														
All licenses, total active in the fiscal year	4,391	6,063	6,497	7,567	9,577	10,186	12,024	12,732	12,598	15,166	12,077	11,542	11,672	20,822
Invention licenses	3,140	3,588	3,747	3,804	4,236	4,163	3,790	4,046	3,854	4,081	3,211	3,882	3,768	3,956
Other intellectual property licenses	1,254	2,475	2,771	3,775	5,341	6,023	8,234	8,686	8,744	11,085	8,866	7,660	7,904	16,866

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
USDA														
All licenses, total active in the fiscal year	255	267	270	296	320	332	339	328	330	344	358	384	400	414
Invention licenses	255	267	270	296	320	332	339	304	302	313	322	341	351	363
Other intellectual property licenses	0	0	0	0	0	0	0	24	28	31	36	43	49	51
DOC														
All licenses, total active in the fiscal year	40	41	101	125	133	111	222	29	40	46	40	41	40	41
Invention licenses	40	41	101	125	133	111	222	29	40	46	40	41	39	41
Other intellectual property licenses	0	0	0	0	0	0	0	0	0	0	0	0	1	0
DOD														
All licenses, total active in the fiscal year	285	471	364	369	412	444	495	365	432	397	633	520	527	NA
Invention licenses	283	350	361	364	406	438	460	351	386	341	431	432	425	297
Other intellectual property licenses	5	121	3	5	6	6	35	14	46	56	202	88	102	NA
DOE														
All licenses, total active in the fiscal year	2,005	3,459	3,687	4,345	5,677	5,916	5,842	6,196	5,742	6,228	5,310	5,328	5,217	5,861
Invention licenses	1,162	1,327	1,223	1,362	1,535	1,420	1,354	1,418	1,452	1,453	1,432	1,428	1,353	1,560
Other intellectual property licenses	843	2,132	2,464	2,983	4,142	4,496	4,488	4,748	4,290	4,775	3,878	3,900	3,864	4,301
EPA														
All licenses, total active in the fiscal year	16	23	32	38	39	35	38	37	40	37	45	42	42	41
Invention licenses	16	23	32	38	39	35	38	37	40	37	45	42	42	41

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Other intellectual property licenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HHS														
All licenses, total active in the fiscal year	1,367	1,356	1,423	1,424	1,532	1,535	1,418	1,675	1,584	1,941	1,613	1,465	1,426	1,555
Invention licenses	1,007	1,213	1,350	1,173	1,237	1,213	915	1,376	1,304	1,240	414	1,090	1,069	1,186
Other intellectual property licenses	360	143	82	251	295	322	460	299	280	701	1,199	375	357	369
DHS														
All licenses, total active in the fiscal year	na	na	na	NA	NA	NA	NA	18	63	458	495	523	1,265	10,313
Invention licenses	na	na	na	NA	NA	NA	NA	NA	45	0	0	0	0	2
Other intellectual property licenses	na	na	na	NA	NA	NA	NA	NA	18	458	495	523	1,265	10,311
DOI														
All licenses, total active in the fiscal year	8	8	11	13	20	21	15	19	21	28	25	26	20	18
Invention licenses	8	8	10	12	19	20	15	18	18	23	23	24	20	16
Other intellectual property licenses	0	0	1	1	1	1	0	1	3	5	2	2	0	2
NASA														
All licenses, total active in the fiscal year	328	357	521	861	1,338	2,856	3,520	3,912	4,181	5,515	3,363	3,013	2,538	2,381
Invention licenses	292	290	312	338	441	308	316	330	146	456	309	284	266	253
Other intellectual property licenses	36	67	209	523	897	2,548	3,204	3,582	4,035	5,059	3,054	2,729	2,272	2,128
DOT														
All licenses, total active in the fiscal year	1	0	0	1	5	5	5	5	2	3	3	3	3	1

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Invention licenses	1	0	0	1	5	5	1	5	3	3	3	3	0	0
Other intellectual property licenses	0	0	0	0	0	0	0	0	0	0	0	0	3	1
VA														
All licenses, total active in the fiscal year	86	81	88	95	101	112	130	153	163	169	192	197	194	197
Invention licenses	76	69	88	95	101	112	130	153	163	169	192	197	194	197
Other intellectual property licenses	10	12	12	12	0	0	0	0	0	0	0	0	0	0
Collaborative R&D relationships														
All 11 agencies														
CRADAs, total active in the fiscal year	3,676	5,377	5,603	6,015	5,947	7,268	7,333	6,954	7,756	8,374	8,240	8,307	8,830	9,180
Traditional CRADAs	2,837	2,858	2,316	3,546	3,962	3,666	3,845	3,712	4,296	4,772	4,569	4,292	5,258	4,891
Other collaborative R&D relationships	NA	NA	8,162	7,454	11,767	9,738	10,568	12,719	17,649	20,538	25,367	24,717	27,051	27,182
USDA														
CRADAs, total active in the fiscal year	219	225	229	205	199	195	230	254	259	273	292	274	259	267
Traditional CRADAs	217	222	212	185	171	163	207	223	207	219	207	211	211	193
Other collaborative R&D relationships	NA	NA	2,769	1,166	5,028	3,477	4,084	5,821	10,306	12,943	15,837	15,878	17,344	17,005
DOC														
CRADAs, total active in the fiscal year	247	1,883	1,903	1,969	1,904	3,008	2,778	2,390	2,397	2,253	2,245	2,410	2,428	2,359
Traditional CRADAs	188	139	92	67	80	149	154	131	101	100	98	153	196	206
Other collaborative R&D relationships	1,575	1,694	1,814	2,301	2,714	2,114	2,672	2,816	2,828	2,897	2,899	2,782	2,977	3,031

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
DOD														
CRADAs, total active in the fiscal year	1,965	1,913	2,134	2,833	2,736	2,999	2,971	2,596	2,870	3,248	2,554	2,400	2,682	2,762
Traditional CRADAs	1,418	1,376	1,523	2,425	2,736	2,424	2,383	1,993	2,247	2,516	1,685	1,328	2,076	2,281
Other collaborative R&D relationships	0	0	0	0	0	0	0	3	1	287	988	0	606	581
DOE														
CRADAs, total active in the fiscal year	558	680	661	610	644	631	697	711	744	697	720	742	742	704
Traditional CRADAs	558	680	661	610	644	631	697	711	744	697	720	742	742	NA
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EPA														
CRADAs, total active in the fiscal year	48	59	91	104	107	94	84	112	112	67	84	92	112	129
Traditional CRADAs	45	55	77	82	95	83	67	74	51	50	54	63	55	52
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HHS														
CRADAs, total active in fiscal year	498	470	427	220	215	164	284	453	457	447	430	377	427	532
Traditional CRADAs	289	261	254	119	117	92	206	295	284	300	284	245	313	378
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	0	0	0	0	114	154
DHS														
CRADAs, total active in the fiscal year	na	na	na	NA	NA	NA	NA	23	23	36	62	94	114	158
Traditional CRADAs	na	na	na	NA	NA	NA	NA	21	22	32	55	89	91	121

Agency	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Other collaborative R&D relationships	na	na	na	NA	NA	NA	NA	3	5	3	11	11	6	31
DOI														
CRADAs, total active in fiscal year	56	52	51	61	70	82	170	170	248	436	351	379	476	601
Traditional CRADAs	41	42	51	45	49	31	20	33	36	29	22	28	21	35
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	0	0	209	283	322	292
NASA														
CRADAs, total active in the fiscal year	1	1	0	0	1	1	1	1	1	0	0	0	0	0
Traditional CRADAs	1	1	0	0	1	1	1	1	1	0	0	0	0	0
Other collaborative R&D relationships	1,053	2,659	3,579	3,987	4,025	4,275	3,812	4,076	4,507	4,379	5,384	5,749	5,656	6,058
DOT														
CRADAs, total active in fiscal year	82	92	96	0	57	59	36	23	22	22	25	29	40	50
Traditional CRADAs	78	80	96	0	55	59	36	23	22	0	0	3	3	7
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	2	29	39	14	26	30
VA														
CRADAs, total active in the fiscal year	2	2	11	13	14	37	82	221	623	895	1,477	1,510	1,550	1,618
Traditional CRADAs	2	2	11	13	14	33	74	207	581	829	1,444	1,430	1,550	1,618
Other collaborative R&D relationships	0	0	0	0	0	0	0	0	0	0	0	0	0	0

na = not applicable; NA = not available.

CRADA = Cooperative R&D Agreement; DHS = Department of Homeland Security; DOC = Department of Commerce; DOD = Department of Defense; DOE = Department of Energy; DOI = Department of the Interior; DOT = Department of Transportation; EPA = Environmental Protection Agency; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; USDA = Department of Agriculture; VA = Department of Veterans Affairs.

Note(s)

DHS started to operate in early 2003; it did not start to provide technology transfer statistics until FY 2008. Invention licenses refer to inventions that are patented or could be patented. Other intellectual property refers to intellectual property protected through mechanisms other than a patent (e.g., copyright). Total CRADAs refers to all agreements executed under CRADA authority (15 USC 3710a). Traditional CRADAs are collaborative R&D partnerships between a federal laboratory and one or more nonfederal organizations. (Nontraditional CRADAs are established for special purposes, such as material transfer or technical assistance that may result in protected information.) Federal agencies have varying authorities for other kinds of collaborative R&D relationships.

Source(s)

National Institute of Standards and Technology, U.S. Department of Commerce, *Federal Laboratory Technology Transfer, Fiscal Year 2014: Summary Report to the President and the Congress* (2016), https://www.nist.gov/sites/default/files/documents/2016/10/26/fy2014_federal_tech_transfer_report.pdf.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-28

Citation of S&E articles in USPTO patents, by cited field and cited country and sector: 2013–16

(Number)

Field and sector	2013	2014	2015	2016
All fields, all sectors	582,179	640,922	633,407	615,028
Foreign	301,659	336,684	337,309	329,291
Unknown country	3,098	3,232	2,913	2,744
United States	277,423	301,006	293,185	282,993
Federal government	11,738	12,428	12,114	11,396
Industry	51,465	56,946	52,842	49,392
Academic	181,090	195,796	193,748	189,995
FFRDCs	5,476	6,011	5,644	5,562
Nonprofit	14,893	16,213	16,367	15,195
State and local government	296	309	269	333
Joint and unknown sectors	12,466	13,304	12,199	11,119
Engineering	76,400	86,803	85,372	84,644
Foreign	45,567	52,782	53,182	53,440
Unknown country	472	535	439	426
United States	30,362	33,485	31,752	30,778
Federal government	863	882	891	802
Industry	7,491	7,742	7,067	6,616
Academic	18,817	21,478	20,635	20,291
FFRDCs	877	1071	981	1,098
Nonprofit	1049	1091	935	859
State and local government	8	8	10	19
Joint and unknown sectors	1,256	1,212	1,231	1,093
Astronomy	127	154	118	183
Foreign	83	98	78	116
Unknown country	0	0	0	0

Field and sector	2013	2014	2015	2016
United States	44	56	39	67
Federal government	4	4	6	8
Industry	9	10	8	10
Academic	22	27	18	40
FFRDCs	8	13	5	7
Nonprofit	1	1	0	0
State and local government	0	0	0	0
Joint and unknown sectors	1	0	2	3
Chemistry	58,913	62,812	64,151	62,141
Foreign	34,934	37,721	39,236	38,039
Unknown country	84	69	47	42
United States	23,895	25,022	24,868	24,060
Federal government	772	796	769	745
Industry	4,233	4,644	4,729	4,175
Academic	16,815	17,357	17,186	17,135
FFRDCs	991	1088	1,015	981
Nonprofit	603	633	701	589
State and local government	3	2	3	11
Joint and unknown sectors	478	503	465	425
Physics	55,656	65,772	63,730	60,958
Foreign	31,703	38,739	39,037	37,653
Unknown country	125	150	99	92
United States	23,828	26,883	24,594	23,213
Federal government	731	771	709	657
Industry	6,466	7,476	6,244	5,334
Academic	13,894	15,502	14,761	14,577
FFRDCs	1,720	1,976	1,905	1,756

Field and sector	2013	2014	2015	2016
Nonprofit	269	307	290	278
State and local government	1	4	3	4
Joint and unknown sectors	747	848	682	607
Geosciences	3,757	4,480	4,092	3,894
Foreign	2,237	2,673	2,537	2,481
Unknown country	38	44	43	41
United States	1,482	1,763	1,512	1,372
Federal government	117	137	97	113
Industry	305	392	319	263
Academic	858	964	887	794
FFRDCs	85	96	59	70
Nonprofit	18	23	29	12
State and local government	9	9	7	6
Joint and unknown sectors	91	142	114	115
Mathematics	1,143	1,252	1,206	1,153
Foreign	580	680	617	631
Unknown country	3	2	3	2
United States	560	570	586	520
Federal government	7	14	11	8
Industry	59	49	49	28
Academic	441	447	472	437
FFRDCs	25	28	15	19
Nonprofit	10	11	10	9
State and local government	0	1	0	0
Joint and unknown sectors	18	20	28	20
Computer sciences	59,078	66,851	65,084	67,353
Foreign	26,703	30,161	30,373	32,046

Field and sector	2013	2014	2015	2016
Unknown country	426	489	420	411
United States	31,950	36,201	34,291	34,896
Federal government	188	191	175	211
Industry	9,207	10,370	9,423	9,510
Academic	20,676	23,775	23,046	23,611
FFRDCs	383	345	363	384
Nonprofit	535	552	412	349
State and local government	1	2	1	0
Joint and unknown sectors	960	967	870	832
Agricultural sciences	4,190	4,576	4,305	4,023
Foreign	2,627	2,982	2,913	2,811
Unknown country	8	8	6	4
United States	1,555	1,586	1,385	1,207
Federal government	256	241	216	211
Industry	173	165	141	120
Academic	1046	1098	966	813
FFRDCs	2	4	3	8
Nonprofit	3	4	7	4
State and local government	1	0	2	0
Joint and unknown sectors	73	73	51	51
Biological sciences	187,154	201,708	200,568	188,592
Foreign	89,416	97,835	97,006	90,565
Unknown country	446	446	403	393
United States	97,292	103,428	103,158	97,634
Federal government	5,525	5,894	5,879	5,359
Industry	16,734	18,323	17,523	16,341
Academic	64,309	67,669	68,108	65,163

Field and sector	2013	2014	2015	2016
FFRDCs	1,148	1,172	1,067	1,003
Nonprofit	6,011	6,646	7,087	6,505
State and local government	144	153	125	158
Joint and unknown sectors	3,420	3,571	3,369	3,107
Medical sciences	131,580	142,320	140,547	137,371
Foreign	66,049	71,236	70,522	69,312
Unknown country	1,458	1,459	1,418	1,304
United States	64,073	69,625	68,606	66,755
Federal government	3,187	3,414	3,303	3,227
Industry	6,478	7,447	6,981	6,593
Academic	42,673	45,930	46,085	45,458
FFRDCs	234	214	217	224
Nonprofit	6,156	6,740	6,713	6,440
State and local government	126	131	113	132
Joint and unknown sectors	5,219	5,750	5,195	4,680
Other life sciences	1,887	1,981	1,996	2,185
Foreign	726	766	825	983
Unknown country	16	14	23	17
United States	1,145	1,201	1,148	1,185
Federal government	43	43	31	27
Industry	249	259	280	340
Academic	532	619	583	595
FFRDCs	2	1	2	7
Nonprofit	193	155	151	116
State and local government	0	0	5	1
Joint and unknown sectors	126	123	96	99
Psychology	1,305	1,244	1,282	1,518

Field and sector	2013	2014	2015	2016
Foreign	547	508	512	688
Unknown country	12	7	5	7
United States	747	729	764	823
Federal government	24	20	20	22
Industry	41	40	43	25
Academic	606	574	621	702
FFRDCs	1	0	2	0
Nonprofit	30	40	22	24
State and local government	2	0	0	0
Joint and unknown sectors	43	55	57	49
Social sciences	989	969	956	1,013
Foreign	486	503	468	526
Unknown country	12	9	7	5
United States	491	457	481	482
Federal government	21	20	7	8
Industry	20	30	36	38
Academic	400	356	379	380
FFRDCs	2	2	8	6
Nonprofit	15	9	11	10
State and local government	0	0	0	2
Joint and unknown sectors	33	40	40	38

FFRDC = federally funded research and development center; USPTO = U.S. Patent and Trademark Office.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics; SRI International; Science-Metrix; PatentsView and USPTO patent data; Elsevier, Scopus abstract and citation database (https://www.scopus.com/), accessed April 2017 (patent data) and July 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-29

Exports and imports of charges for the use of intellectual property, by selected region, country, or economy: 2008–16

(Millions of U.S. dollars)

Region, country, or economy	2008	2009	2010	2011	2012	2013	2014	2015	2016
Exports									
World	188,228	179,244	198,576	233,564	237,496	252,951	275,157	271,211	272,411
Selected developed countries or economies									
Australia	725	775	973	946	859	812	857	796	813
Canada	4,109	3,596	2,814	3,345	3,932	4,571	4,543	4,329	4,468
EU	49,238	44,383	38,360	48,978	46,436	52,335	66,286	67,453	66,471
Hong Kong	380	383	400	459	520	574	623	642	NA
Japan	25,687	21,669	26,683	29,058	31,890	31,573	37,385	36,477	39,013
Norway	233	124	339	322	350	304	478	510	410
Singapore	784	842	976	1,662	1,857	3,176	3,784	5,180	5,340
South Korea	2,434	3,255	3,188	4,399	3,903	4,328	5,167	6,199	6,622
Switzerland	9,104	12,084	13,358	15,764	17,281	18,613	18,221	16,178	17,539
Taiwan	191	242	460	838	932	1,017	866	1,190	1,235
United States	102,125	98,406	107,521	123,333	124,440	128,034	129,890	124,664	122,226
Selected developing countries or economies									
Brazil	465	434	190	301	276	368	375	581	651
China	571	429	830	743	1,044	887	676	1,081	1,172
India	148	192	127	303	321	446	659	467	529
Malaysia	199	266	101	149	136	110	76	92	115
Philippines	3	2	4	5	8	3	10	11	9
Russian Federation	406	381	386	556	664	738	666	726	548
Imports									
World	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selected developed countries or economies									

Region, country, or economy	2008	2009	2010	2011	2012	2013	2014	2015	2016
Australia	2,953	2,794	3,412	4,107	4,186	3,978	3,991	3,493	3,340
Canada	8,931	8,892	9,731	10,409	10,902	11,805	11,630	9,855	9,684
EU	81,493	69,219	52,971	58,186	56,532	60,800	92,262	108,648	109,353
Hong Kong	1,610	1,700	1,978	2,009	2,018	2,027	1,938	1,861	NA
Japan	18,292	16,831	18,774	19,158	19,897	17,820	20,866	17,034	19,672
Norway	460	318	634	779	588	668	654	570	589
Singapore	13,483	13,227	16,610	19,621	22,046	22,566	20,547	18,698	19,276
South Korea	5,823	7,356	9,183	7,415	8,617	9,837	10,546	10,056	9,292
Switzerland	4,978	6,996	8,025	10,650	11,111	11,769	14,143	12,932	12,075
Taiwan	3,015	3,424	4,943	5,788	4,513	3,795	3,746	3,474	3,401
United States	29,623	31,297	32,551	36,087	38,661	38,860	42,208	39,495	42,743
Selected developing countries or economies									
Brazil	10,320	11,065	13,040	14,706	17,749	21,033	22,610	22,033	23,977
China	2,697	2,512	3,226	3,748	4,198	4,567	5,923	5,250	5,141
India	1,529	1,860	2,438	2,819	3,990	3,904	4,849	5,009	5,470
Malaysia	1,268	1,133	1,318	1,634	1,543	1,395	1,424	1,257	1,319
Philippines	387	412	446	442	471	529	547	613	546
Russian Federation	4,481	3,987	4,842	5,830	7,629	8,371	8,021	5,634	4,997

NA = not available.

EU = European Union.

Note(s)

EU exports do not include intra-EU exports.

Source(s)

World Trade Organization, International trade and tariff data, https://www.wto.org/english/res_e/statis_e/statis_e.htm, accessed 15 August 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-30

Global venture capital investment, by financing stage and selected region, country, or economy: 2006–16

(Millions of U.S. dollars)

Financing stage and industry or technology	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All stages											
Global	35,534	45,068	48,117	33,585	43,486	61,558	56,549	61,818	103,459	135,093	130,534
United States	28,719	34,627	35,956	25,386	29,385	42,478	38,806	42,399	65,157	73,918	68,549
China	1,066	1,100	1,767	980	2,683	5,894	3,204	2,686	12,099	27,428	34,149
EU	3,333	6,244	6,448	4,117	6,544	6,457	7,174	8,150	11,705	15,230	11,902
France	674	873	862	708	941	841	1,056	976	1,137	1,640	1,672
Germany	310	619	1,050	514	737	1,440	1,485	1,558	3,249	3,210	1,943
United Kingdom	1,149	1,881	2,168	1,236	3,173	1,636	2,780	3,014	4,089	6,168	4,854
All others	1,198	2,873	2,368	1,660	1,692	2,540	1,854	2,601	3,231	4,212	3,434
Canada	739	916	982	630	863	1,403	1,270	1,436	1,599	1,687	3,177
India	512	437	633	358	638	1,254	1,147	1,453	5,051	8,155	3,473
Israel	623	509	786	474	935	988	976	778	1,080	1,228	2,415
ROW	546	1,232	1,547	1,642	2,439	3,084	3,973	4,917	6,768	7,447	6,869
Seed stage											
Global	313	426	568	477	938	1,413	2,409	3,492	4,035	5,239	5,810
United States	184	213	291	311	435	977	1,727	2,387	2,616	3,111	3,342
China	2	1	1	8	14	15	11	31	139	146	71
EU	66	100	147	109	364	218	331	520	673	814	924
France	20	15	12	19	9	26	18	32	59	94	66
Germany	8	15	25	10	12	33	28	42	57	66	73
United Kingdom	25	38	75	33	256	77	138	227	294	303	476
All others	13	33	35	47	86	83	147	219	264	351	309
Canada	20	32	50	12	24	68	102	107	178	156	194

Financing stage and industry or technology	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
India	17	7	4	6	5	9	36	87	69	456	184
Israel	5	29	30	8	10	18	44	66	63	100	737
ROW	20	43	46	24	86	108	158	294	298	456	359
Early stage											
Global	16,401	19,768	20,828	13,603	18,499	21,571	21,403	22,336	33,459	45,396	52,042
United States	12,805	14,536	14,464	9,275	10,712	13,558	12,653	14,526	19,923	23,709	23,178
China	555	718	1,108	532	1,288	2,243	1,415	1,058	4,221	10,721	16,523
EU	1,878	2,754	2,872	2,209	3,699	2,460	3,737	2,830	3,980	5,293	5,581
France	493	555	376	428	464	359	377	426	460	612	747
Germany	158	136	560	213	251	469	988	461	704	662	799
United Kingdom	593	1,007	1,053	612	1,955	610	1,458	1,074	1,633	2,296	1,964
All others	633	1,057	883	957	1,029	1,022	914	868	1,183	1,723	2,072
Canada	250	546	377	323	280	598	401	626	475	536	1,979
India	346	188	391	194	379	826	542	374	702	1,581	1,043
Israel	280	357	477	291	649	331	278	321	465	483	818
ROW	289	668	1,140	779	1,492	1,555	2,377	2,602	3,692	3,073	2,920
Later stage											
Global	18,820	24,874	26,721	19,505	24,049	38,574	32,737	35,990	65,965	84,458	72,682
United States	15,730	19,878	21,201	15,800	18,238	27,943	24,426	25,486	42,618	47,098	42,029
China	509	381	658	440	1,381	3,636	1,778	1,597	7,739	16,561	17,555
EU	1,389	3,390	3,429	1,799	2,481	3,779	3,106	4,800	7,052	9,123	5,397
France	161	303	474	261	468	456	661	518	618	934	859
Germany	144	468	465	291	474	938	469	1,055	2,488	2,482	1,071
United Kingdom	531	836	1,040	591	962	949	1,184	1,713	2,162	3,569	2,414
All others	552	1,783	1,450	656	577	1,435	793	1,514	1,784	2,138	1,053
Canada	469	338	555	295	559	737	767	703	946	995	1,004
India	149	242	238	158	254	419	569	992	4,280	6,118	2,246

Financing stage and industry or technology	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Israel	338	123	279	175	276	639	654	391	552	645	860
ROW	237	521	361	839	861	1,421	1,438	2,021	2,778	3,918	3,590

EU = European Union; ROW = rest of world.

Note(s)

Seed financing supports proof-of-concept development and initial product development and marketing. Early stage financing supports product development and marketing, the initiation of commercial manufacturing, and sales; it also supports company expansion and provides financing to prepare for an initial public offering. Later-stage financing includes acquisition financing and management and leveraged buyouts.

Source(s)

PitchBook, Venture capital and private equity database, https://my.pitchbook.com/.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-31

Definitions of industry or technologies of venture capital data

(List of industries or technologies and definitions)

Industry or technology	Definition
3-D printing	Refers to the manufacturing process and all technology related to printing a three-dimensional object; 3-D printing encompasses the actual printer as well as software, including 3-D versions of computer-aided design, which utilizes multiple data points to create cross-sectional patterns of the object to be formed.
Advertising technology	All technologies, software, and services used for delivering, controlling, and targeting online advertising.
Agriculture technology	Companies that develop software and hardware systems to automate and manage farming processes and promote environmentally conscious agriculture. These include wireless sensors to monitor soil, air, and animal health; hydroponic and aquaponic systems; remote-controlled irrigation systems; aerial photo technology to analyze field conditions; biotech platforms for crop yields; data-analysis software to augment planting, herd, poultry, and livestock management; automation software to manage farm-task workflows; and accounting software to track and manage facility and task expenses.
Artificial intelligence and machine learning	Companies developing technologies that enable computers to learn, deduce, and act autonomously, through utilization of large data sets. The technology enables development of systems that collect and store massive amounts of data and that analyze such content to make decisions based on probability and statistical analysis. Applications for artificial intelligence and machine learning include speech recognition, computer vision, robotic control, and accelerating processes in the empirical sciences, where large data sets are essential, such as gene sequencing in life sciences.
Audio technology	Developers of software and hardware technology for the music industry. Includes providers of on-demand music services that connect products from music artists with the public. Also includes developers of audio technology for the professional and consumer sound markets, including earphones, transmitters, automobile sound systems, and home and studio systems.
Autonomous cars	Companies that develop street-legal vehicles that can sense their environments and navigate without human interaction. Includes related technology, which is based on radar, light detection and ranging, GPS, odometry, software, and computer vision.
Big data	Companies providing a product or service where the core technology handles data that are too large for traditional database systems, usually due to data volume, data velocity, or data variety.
Clean technology	Developers of technology that seeks to reduce the environmental impact of human activities or to reduce significantly the amount of natural resources consumed through such activities.
Cybersecurity	Information technology companies that provide a solution specifically oriented toward providing user and network security.
E-commerce	This includes online retailers, online marketplaces, social commerce, and logistics and shipping for online retailers and for providers of software and hosting services for online retail.

Industry or technology	Definition
Education technology	Software or hardware created to enhance teaching practices and improve learning outcomes.
Ephemeral content	Companies that provide online platforms for the sharing and temporary display of photos, videos, messages, documents, and other content. The key aspect is that the content vanishes from the Web after a certain time frame.
Finance technology	Companies engaged in providing software and hardware to enable automated financial transactions.
Health technology	Companies that provide mobility and other information technologies to improve health care delivery while decreasing costs. It entails the use of technology and services—including cloud computing, Internet services, and social mobility—to optimize patient-centric health care.
Infrastructure	Companies owning physical assets necessary for the movement of goods, multimodal commerce, or power generation.
Internet of Things	A company that provides a product that is enabled with sensors and actuators embedded in physical objects or software that uses these sensor data to improve the user experience or allows for sharing these data with a network of other devices, often using the same Internet Protocol that connects the Internet.
Life sciences	Companies involved in sciences dealing with living organisms and life processes, including biology, pharmaceuticals, biomedical technology, and nutraceuticals.
Lifestyles of health and sustainability	Companies that provide consumer products or services focused on health, the environment, green technology, social justice, personal development, and sustainable living.
Manufacturing	Companies that produce products that require the heavy use of capital equipment and raw materials.
Marketing technology	Marketing technology consists of digital technology to automate and simplify the marketing process. This includes tools for search-engine optimization, customer analytics, customer-relationship management, loyalty programs, and applications that leverage social media for connecting brands with consumers.
Mobile	Companies whose primary revenue source comes from providing services for mobile devices or enabling mobile communications.
Nanotechnology	Companies engaged in creating products that are dependent on the ability to manipulate materials at an atomic level, usually due to the materials exhibiting novel properties at the subatomic level.
Oncology	Companies involved in the diagnosis or treatment of cancer without regard to whether they do so through the production of pharmaceuticals, devices, or service-based models.
Robotics and drones	Automated or remote-controlled mechanical devices and technology. These include machinery programmed to perform repetitive tasks, such as manufacturing and loading; precision tasks, such as surgery or semiconductor production; and remote-operated movement or travel, such as that provided by unmanned aerial vehicles, subsea vehicles, and land vehicles.
Software as a service	Information technology companies that provide their software using client-server architectures that host the application in a centralized, off-site location.

Industry or technology	Definition
Virtual reality	Technology, including hardware and software, providing an immersive, 3-D user experience in a virtual world. Virtual-reality environments are provided through a computer screen augmented with wearable devices, such as head-mounted stereoptical displays or sensor-embedded gloves. Virtual reality also includes remote communication environments, where users interact with each other through computer-generated avatars.
Wearables and quantified self	A consumer health care sector entailing sensor-based tracking of aspects of a user's life, including moods, nutrition, and activities. This category entails use of wireless sensors that can be attached to a person through clothing, attached to the body, or ingested into the body. The data can be used for self-tracking for better understanding of individual health and behavioral capacities. Common uses for this technology include fitness assessment, stress analysis, sleep monitoring, biofeedback applications, and monitoring of behavioral changes.

GPS = global positioning system.

Source(s)

PitchBook, Venture capital and private equity database, https://my.pitchbook.com/.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-32

U.S. seed-stage venture capital investment, by industry: 2011–16

(Millions of dollars)

Industry	2011	2012	2013	2014	2015	2016
3-D printing	0.8	5.8	2.4	22.4	13.6	13.6
Advertising technology	17.8	53.5	50.6	79.4	53.8	38.6
Agriculture technology	1.1	6.6	5.6	12.1	14.8	19.0
Artificial intelligence and machine learning	9.9	42.7	66.0	97.3	189.4	347.3
Audio technology	2.3	10.7	14.0	19.2	10.8	13.1
Autonomous cars	0.0	0.3	0.0	11.0	5.5	73.9
Big data	32.9	93.3	151.9	168.3	303.1	294.5
Clean technology	17.8	28.8	37.6	34.8	40.9	46.2
Cybersecurity	8.8	32.8	66.6	94.8	103.9	100.0
E-commerce	78.2	148.5	182.8	228.6	176.3	230.3
Education technology	31.0	65.4	72.4	73.5	81.7	85.8
Ephemeral content	0.0	0.5	0.6	1.5	0.0	0.5
Finance technology	37.1	71.9	144.5	208.1	331.8	263.9
Health technology	18.7	51.9	80.9	111.7	157.3	151.8
Infrastructure	0.0	2.0	3.3	4.4	4.6	4.3
Insurance technology	1.9	5.8	19.5	17.8	39.1	34.7
Internet of Things	8.5	18.5	36.8	71.1	104.5	140.6
Life sciences	39.7	54.4	52.2	68.0	128.6	141.3
LOHAS	23.5	18.6	36.0	75.1	91.0	102.2
Manufacturing	15.9	42.3	65.3	80.1	86.5	135.8
Marketing technology	46.7	77.9	99.4	111.2	98.1	87.5
Mobile	206.1	400.5	622.5	753.6	756.1	746.0
Nanotechnology	0.5	14.3	8.3	5.2	22.3	12.5
Oncology	12.1	26.2	15.2	21.8	44.2	26.1
Robotics and drones	1.3	2.7	12.8	23.6	47.6	174.8

Industry	2011	2012	2013	2014	2015	2016
Software as a service	250.4	439.4	648.0	796.1	805.0	827.2
Virtual reality	2.5	26.6	10.3	26.3	30.9	72.0
Wearables and quantified self	4.3	29.2	22.0	50.3	64.3	50.5

LOHAS = lifestyles of health and sustainability.

Note(s)

Seed financing supports proof-of-concept development and initial product development and marketing.

Source(s)

PitchBook, Venture capital and private equity database, https://my.pitchbook.com/.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-33

U.S. early and later-stage venture capital investment, by industry: 2011–16

(Millions of dollars)

Industry or technology	2011	2012	2013	2014	2015	2016
3-D printing	52.2	28.4	85.9	97.1	176.8	611.7
Advertising technology	3,379.2	1,207.3	1,193.8	1,401.8	1,515.9	634.6
Agriculture technology	225.2	200.5	184.5	458.7	371.8	621.8
Artificial intelligence and machine learning	728.8	717.5	1,234.9	2,790.2	2,090.0	3,899.3
Audio technology	218.2	272.6	171.8	290.7	222.9	58.0
Autonomous cars	0.1	0.3	55.5	59.2	128.9	458.9
Big data	1,226.8	1,204.6	2,323.0	4,446.5	4,710.3	4,273.8
Clean technology	4,787.0	3,960.2	2,675.8	3,061.6	2,457.7	2,958.5
Cybersecurity	1,099.0	1,680.6	1,817.1	2,310.0	3,483.7	2,694.9
E-commerce	3,437.4	2,433.8	2,638.7	6,783.6	10,048.2	10,021.4
Education technology	440.7	544.6	851.5	1,041.0	1,410.6	894.0
Ephemeral content	7.0	50.0	73.5	545.3	214.0	1,860.6
Financial technology	1,145.1	1,522.4	1,792.6	4,490.8	6,964.2	5,004.0
Health technology	832.7	785.6	1,488.6	2,137.6	3,190.1	2,760.8
Infrastructure	379.3	774.8	259.8	196.0	233.7	602.5
Insurance technology	3.2	60.0	189.3	390.4	1,265.0	1,208.4
Internet of Things	578.3	557.0	593.5	996.9	805.0	1,179.4
Life sciences	4,647.3	5,221.3	5,715.0	8,316.0	10,101.9	8,837.3
LOHAS	1,520.2	2,167.9	1,510.7	3,805.2	5,020.2	8,678.5
Manufacturing	4,607.3	3,906.5	3,385.6	3,904.9	3,424.7	2,185.5
Marketing technology	1,479.5	1,139.1	1,489.7	1,969.3	2,375.3	1,677.3
Mobile	8,673.7	4,896.9	6,755.8	13,572.5	17,025.1	17,540.5
Nanotechnology	570.0	345.5	378.1	423.2	473.5	388.8
Oncology	1,963.3	1,942.5	1,967.2	3,429.0	4,459.8	4,343.0
Robotics and drones	112.9	182.3	264.9	313.2	608.0	641.2

Industry or technology	2011	2012	2013	2014	2015	2016
Software as a service	9,230.5	9,016.4	10,607.2	17,221.5	18,719.5	16,066.2
Virtual reality	22.8	46.0	164.0	737.0	371.5	1,392.8
Wearables and quantified self	230.7	228.7	331.4	1,359.2	413.4	1,598.3

LOHAS = lifestyles of health and sustainability.

Note(s)

Early stage financing supports product development and marketing, the initiation of commercial manufacturing, and sales; it also supports company expansion and provides financing to prepare for an initial public offering. Later-stage financing includes acquisition financing, management buyouts, and leveraged buyouts.

Source(s)

PitchBook, venture capital and private equity database, https://my.pitchbook.com/.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-34

China early and later-stage venture capital investment, by industry: 2011–16

(Millions of dollars)

Industry	2011	2012	2013	2014	2015	2016
3-D printing	0.0	0.0	0.0	0.0	3.0	0.0
Advertising technology	191.0	72.0	153.8	363.0	792.0	0.0
Agricultural technology	0.0	0.0	0.0	30.0	85.0	0.0
Artificial intelligence and machine learning	0.0	1.6	37.3	108.0	1,061.9	258.2
Audio technology	0.0	0.0	0.0	1.6	33.0	46.0
Autonomous cars	0.0	0.0	0.0	0.0	507.9	15.0
Big data	26.0	7.0	39.1	240.3	307.4	824.9
Clean technology	52.0	12.7	26.0	88.0	597.0	78.7
Cybersecurity	37.8	6.5	73.8	61.7	43.3	151.9
E-commerce	2,889.9	785.1	883.4	2,486.5	5,673.9	6,632.4
Educational technology	42.9	44.2	58.5	326.2	1,112.1	384.2
Financial technology	14.8	94.4	153.0	616.0	4,047.7	7,656.1
Health technology	25.2	222.0	13.0	83.5	298.8	260.6
Infrastructure	10.0	9.5	0.0	3.3	1.6	232.1
Insurance technology	0.0	0.0	0.0	0.0	31.0	97.3
Internet of Things	92.6	223.7	100.2	1,214.6	261.5	107.8
Life sciences	223.7	733.0	168.0	108.7	297.1	907.2
LOHAS	12.5	0.0	0.0	3.2	567.6	120.0
Manufacturing	162.5	438.4	85.6	478.3	503.5	438.0
Marketing technology	34.0	32.0	30.5	64.5	122.6	15.0
Mobile	1,202.6	591.1	729.6	5,442.0	11,909.6	16,664.8
Nanotechnology	0.0	0.0	0.0	0.0	2.0	0.0
Oncology	139.1	25.0	135.0	65.0	242.5	639.7
Robotics and drones	0.0	0.0	9.0	103.0	307.1	141.7
Software as a service	333.3	308.7	313.8	1,721.2	5,967.6	6,079.2

Industry	2011	2012	2013	2014	2015	2016
Virtual reality	0.0	0.0	0.0	16.7	61.2	3.3
Wearables and quantified self	3.1	1.6	0.0	119.8	158.1	50.0

LOHAS = lifestyles of health and sustainability.

Note(s)

China includes Hong Kong. Early stage financing supports product development and marketing, the initiation of commercial manufacturing, and sales; it also supports company expansion and provides financing to prepare for an initial public offering. Later-stage financing includes acquisition financing and management and leveraged buyouts.

Source(s)

PitchBook, Venture capital and private equity database, https://my.pitchbook.com/.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-35

SBIR and STTR awards, by type of award: FYs 1983–2015

(Number)

Fiscal year	SBIR			STTR		
	Total	Phase I	Phase II	Total	Phase I	Phase II
1983	789	789	0	na	na	na
1984	1,292	1,015	277	na	na	na
1985	1,838	1,483	355	na	na	na
1986	2,172	1,599	573	na	na	na
1987	2,766	2,065	701	na	na	na
1988	2,664	1,955	709	na	na	na
1989	2,813	2,045	768	na	na	na
1990	3,220	2,374	846	na	na	na
1991	3,397	2,642	755	na	na	na
1992	3,598	2,677	921	na	na	na
1993	4,010	2,964	1,046	na	na	na
1994	4,028	3,129	899	na	na	na
1995	4,367	3,092	1,275	1	1	0
1996	4,051	2,845	1,206	0	0	0
1997	4,786	3,369	1,417	0	0	0
1998	4,289	3,021	1,268	209	208	1
1999	4,637	3,381	1,256	375	301	74
2000	5,286	3,941	1,345	410	315	95
2001	5,825	4,281	1,544	409	318	91
2002	6,750	5,148	1,602	468	369	99
2003	6,844	5,100	1,744	572	459	113
2004	6,381	4,392	1,989	903	719	184
2005	6,085	4,216	1,869	801	579	222
2006	5,658	3,746	1,912	858	630	228

Fiscal year	SBIR			STTR		
	Total	Phase I	Phase II	Total	Phase I	Phase II
2007	5,399	3,814	1,585	848	637	211
2008	5,555	3,698	1,857	734	482	252
2009	5,816	4,016	1,800	831	593	238
2010	6,258	4,301	1,957	903	625	278
2011	5,403	3,628	1,775	709	468	241
2012	5,015	3,417	1,598	637	467	170
2013	4,520	3,017	1,503	642	456	186
2014	4,598	3,092	1,506	703	493	210
2015	4,508	2,939	1,569	725	553	172

na = not applicable.

SBIR = Small Business Innovation Research; STTR = Small Business Technology Transfer.

Source(s)

U.S. Small Business Administration, SBIR/STTR official website, https://www.sbir.gov/awards/annual-reports, accessed 1 March 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-36

SBIR award funding, by type of award and federal agency: FYs 1983–2015

(Millions of dollars)

Fiscal year	Type			Agency										
	All	Phase I	Phase II	USDA	DOC	DOD	ED	DOE	HHS	DHS[a]	DOT	EPA	NASA	NSF
1983	38.1	38.1	0.0	0.6	0.0	15.6	0.3	5.0	7.2	na	0.3	0.2	4.9	3.5
1984	149.9	49.3	100.6	2.0	0.0	49.8	1.0	26.2	32.4	na	1.7	0.9	29.9	4.2
1985	195.3	74.5	120.8	3.1	0.2	95.8	1.2	27.0	44.1	na	3.2	1.9	7.8	9.8
1986	305.7	82.0	223.7	3.5	0.9	159.5	1.7	25.0	66.4	na	3.7	2.7	32.5	8.6
1987	271.8	103.8	168.0	3.5	1.7	142.3	1.5	23.3	48.3	na	2.7	3.0	28.4	16.2
1988	392.3	99.1	293.2	3.8	1.4	198.9	2.2	36.3	75.4	na	3.4	3.0	49.2	18.1
1989	400.8	102.8	298.0	3.9	1.1	194.7	1.9	36.2	79.5	na	3.7	3.1	57.6	18.0
1990	453.3	120.9	332.4	4.1	0.7	219.6	2.5	41.5	89.1	na	4.1	3.2	68.5	19.4
1991	453.4	133.0	320.4	4.9	1.2	201.4	2.6	41.6	95.7	na	5.4	3.5	74.2	22.4
1992	531.6	134.6	397.0	5.7	2.0	257.4	1.7	43.1	104.7	na	3.5	4.0	85.5	22.4
1993	630.5	161.7	468.7	7.1	2.3	330.2	2.9	49.5	146.0	na	5.1	4.5	59.1	22.1
1994	601.6	222.4	379.2	7.5	3.7	268.5	2.9	52.0	118.5	na	8.5	5.0	106.4	27.0
1995	962.2	236.5	725.8	11.3	7.6	448.0	3.4	70.8	218.0	na	10.2	7.0	145.7	38.9
1996	925.7	228.6	697.1	9.5	6.1	496.9	3.5	66.9	176.2	na	7.9	4.8	113.1	40.1
1997	1,132.5	281.1	851.4	9.7	7.3	558.6	3.9	73.9	283.4	na	6.8	5.6	130.5	52.6

Fiscal year	Type			Agency										
	All	Phase I	Phase II	USDA	DOC	DOD	ED	DOE	HHS	DHS[a]	DOT	EPA	NASA	NSF
1998	1,050.4	261.8	788.6	12.7	6.8	568.5	6.5	77.2	233.1	na	5.9	4.8	83.2	51.6
1999	1,123.3	294.3	829.1	12.3	7.0	520.3	4.5	79.1	331.1	na	7.3	5.1	98.8	57.9
2000	1,058.9	293.7	765.1	18.1	6.2	544.7	0.0	85.6	231.2	na	3.6	7.9	99.7	61.8
2001	1,181.8	307.7	874.1	15.7	6.8	605.2	7.1	88.4	283.1	na	4.5	6.1	102.8	62.1
2002	1,504.9	423.2	1,081.8	17.2	6.9	661.5	6.7	94.5	458.5	na	4.6	7.6	187.3	60.2
2003	1,742.5	467.2	1,275.3	16.7	7.9	955.7	9.0	94.9	549.4	na	3.3	6.2	22.9	76.4
2004	1,970.6	493.6	1,476.9	18.7	8.3	1,033.1	7.4	107.3	574.3	10.7	3.7	3.0	114.2	89.8
2005	1,862.5	452.5	1,410.0	18.4	9.0	948.5	8.9	100.6	554.9	30.7	2.5	6.2	103.2	79.6
2006	1,914.8	424.8	1,490.0	16.5	7.0	1,007.9	9.7	114.3	566.6	13.9	3.3	8.0	106.2	61.4
2007	1,705.0	447.5	1,257.5	18.1	2.3	865.1	10.0	108.5	491.3	36.4	1.9	6.6	96.8	67.9
2008	1,884.3	449.5	1,434.9	18.7	5.8	967.7	9.9	129.7	560.3	22.2	5.3	3.4	99.3	62.2
2009	1,964.8	503.4	1,461.5	16.1	12.5	906.8	9.9	151.0	615.5	19.9	3.8	4.7	133.0	91.6
2010	2,300.1	564.9	1,735.2	22.9	7.3	1,169.2	10.1	198.0	606.1	27.5	7.5	9.4	137.0	106.0
2011	2,052.4	507.6	1,544.8	22.4	6.1	942.7	12.2	140.9	628.2	20.7	10.1	4.7	175.7	88.6
2012	2,037.8	561.7	1,476.1	16.8	4.5	960.4	12.0	132.6	684.2	17.6	9.1	4.1	100.5	96.0
2013	1,927.0	489.9	1,437.1	18.2	5.3	865.0	9.3	144.0	651.8	18.8	7.8	4.2	96.3	106.3
2014	1,983.8	502.6	1,481.2	19.0	6.9	762.1	8.4	174.0	726.4	15.0	11.2	4.8	146.0	109.2
2015	1,922.8	462.0	1,460.8	22.0	9.0	947.0	7.5	191.3	415.8	21.4	11.0	4.5	149.1	140.3

na = not applicable.

DHS = Department of Homeland Security; DOC = Department of Commerce; DOD = Department of Defense; DOE = Department of Energy; DOT = Department of Transportation; ED = Department of Education; EPA = Environmental Protection Agency; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; SBIR = Small Business Innovation Research; USDA = Department of Agriculture.

[a] DHS, established by the Homeland Security Act of 2002 and formed in January 2003, held its first SBIR competition in FY 2004.

Note(s)

Detail may not add to total because of rounding.

Source(s)

U.S. Small Business Administration, SBIR/Small Business Technology Transfer official website, https://www.sbir.gov/awards/annual-reports, accessed 1 March 2017.

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APPENDIX TABLE 8-37

STTR award funding, by type of award and federal agency: FYs 1995–2015

(Millions of dollars)

Fiscal year	Type			Agency										
	All	Phase I	Phase II	USDA	DOC	DOD	ED	DOE	HHS	DHS[a]	DOT	EPA	NASA	NSF
1995	0.1	0.1	0.0	na	na	na	na	na	0.1	na	na	na	na	na
1996	0.0	0.0	0.0	na	na	na	na	na	0.0	na	na	na	na	na
1997	0.0	0.0	0.0	na	na	na	na	na	0.0	na	na	na	na	na
1998	20.0	19.5	0.5	na	na	8.1	na	1.4	9.3	na	na	na	na	1.2
1999	56.3	24.4	31.9	na	na	25.0	na	4.4	13.2	na	na	na	9.7	4.0
2000	64.0	23.7	40.3	na	na	32.2	na	5.2	17.0	na	na	na	5.5	4.1
2001	62.6	24.9	37.7	na	na	25.7	na	4.3	19.0	na	na	na	5.4	8.2
2002	85.4	31.0	54.4	na	na	36.1	na	7.2	32.2	na	na	na	4.5	5.4
2003	109.2	41.5	67.7	na	na	55.3	na	7.3	33.8	na	na	na	7.0	5.9
2004	205.6	82.4	123.2	na	na	105.2	na	7.5	74.1	na	na	na	12.9	5.9
2005	226.4	66.1	160.3	na	na	118.5	na	12.2	69.3	na	na	na	19.5	7.0
2006	242.2	78.4	163.8	na	na	131.6	na	14.1	70.3	0.4	na	na	13.1	12.7
2007	243.1	83.8	159.3	na	na	119.2	na	15.1	74.7	0.8	na	na	10.5	22.8
2008	252.8	61.1	191.7	na	na	121.2	na	18.2	73.9	0.5	na	na	11.7	27.3
2009	241.0	72.2	168.8	na	na	129.3	na	14.2	58.0	NA	na	na	15.2	24.2
2010	298.7	78.9	219.8	na	na	165.9	na	22.5	80.4	NA	na	na	16.8	13.2
2011	266.6	67.7	198.9	na	na	128.9	na	18.8	88.2	NA	na	na	21.5	9.2
2012	222.5	73.1	149.4	na	na	109.0	na	16.3	79.5	NA	na	na	12.5	5.2
2013	218.9	74.1	144.7	na	na	108.4	na	20.2	67.8	NA	na	na	13.9	8.6
2014	284.2	95.1	189.1	na	na	112.7	na	25.3	103.7	NA	na	na	21.4	21.1
2015	257.6	98.5	159.1	na	na	125.5	na	26.4	62.9	NA	na	na	22.1	20.3

na = not applicable; NA = not available.

DHS = Department of Homeland Security; DOC = Department of Commerce; DOD = Department of Defense; DOE = Department of Energy; DOT = Department of Transportation; ED = Department of Education; EPA = Environmental Protection Agency; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; STTR = Small Business Technology Transfer; USDA = Department of Agriculture.

[a] DHS, established by the Homeland Security Act of 2002 and formed in January 2003, held its first STTR competition in FY 2006.

Note(s)

Detail may not add to total because of rounding.

Source(s)

U.S. Small Business Administration, Small Business Innovation Research/STTR official website, https://www.sbir.gov/awards/annual-reports, accessed 1 March 2017.

Science and Engineering Indicators 2018

APPENDIX TABLE 8-38

Federal policies and programs supporting early stage technology development and innovation

(Summary of programs and policies for selected federal agencies)

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
Department of Agriculture																
Under Secretary for Natural Resources and Environment	U.S. Forest Service	Forest Products Laboratory (FPL) Business Incubator	X						X							
		Consortium for Research on Renewable Industrial Materials (CORRIM)		X												
Under Secretary for Research, Education, and Economics	Agricultural Research Service (ARS)	ARS Innovation Corps (I-Corps ARS)								X		X		X		
		Agricultural Research Partnerships (ARP) Network	X	X					X		X	X	X			

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Agricultural Technology Innovation Partnership (ATIP)		X					X		X					
	National Institute of Food and Agriculture (NIFA)	Innovations in Food and Agricultural Science and Technology (I-FAST) Prize Competition								X	X	X		X		
Program descriptions	FPL Business Incubator	Program goals: To expedite the discovery and application of new science, the FPL is in the initial stages of developing a business incubator for emerging or fledgling advanced wood technology business ventures.														
		Program activities: Private startups or other entities needing expanded production resources can rent space and equipment at the FPL to pilot test new products or process innovations. By developing product prototypes without excessive overhead costs, business incubator associates can sell these products in limited quantities. These companies will conduct research in partnership with FPL scientists and technical staff in existing FPL laboratories. When appropriate, companies can also enter into joint-venture agreements for collaborative research.														
		Website: https://www.fpl.fs.fed.us/partners/businessincubator/index.shtml														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	CORRIM	Program goals: The CORRIM research plan develops a scientific base of information relating to the environmental performance of wood-based building products. The research plan provides (1) a consistent life-cycle inventory database for evaluating the environmental performance of wood and alternative materials from resource regeneration or extraction to end use and disposal; (2) a framework for evaluating life-cycle environmental and economic impacts; (3) source data for many users, including resource managers, manufacturers, architects, engineers, environmental protection and energy analysts, and policy specialists; and (4) continuously updated wood products life-cycle assessment (LCA) underlying data for making LCA-based environmental product declaration (EPD) eco-labels renewals easy and cost-effective, and providing valuable environmental performance feedback to industry.														
		Program activities: CORRIM research provides a transparent and credible database of information for quantifying environmental impacts and economic costs of wood building materials through the stages of tree planting, growing, product manufacturing, building construction, and its operational use and demolition. Current research provides a component-by-component assessment of environmental impacts to assist in making building design changes that can improve performance along with development of North American-wide EPDs. CORRIM's geographic, product, and building design coverage was expanded in order to identify more opportunities for improved performance. As part of the any wood product LCA and EPD updates, CORRIM addresses pressing research issues including carbon sequestration, temporal and spatial aspects of forest harvesting, land use and land use changes (direct and indirect), and the impact of changes in forest carbon inventories.														
		Website: https://www.fpl.fs.fed.us/partners/corrim/corrim.shtml														
	I-Corps ARS	Program goals: The I-Corps ARS pilot was a set of activities and programs that prepared ARS scientists to extend their focus beyond the laboratory and broadened the impact of select ARS research projects.														
		Program activities: The I-Corps ARS curriculum, based on the National Science Foundation (NSF) I-Corps, taught research teams to identify the problems facing stakeholders and develop valuable products and/ or technologies that can emerge from their own research. In addition, I-Corps ARS offered entrepreneurship training, which helped the participants to be more innovative in their research programs. I-Corps ARS was the first program in a government-owned, government-operated environment (GOGO) that has an intramural focus with the goal of creating an entrepreneurial scientific enterprise.														
		Website: NA														
	ARP Network	Program goals: The ARS founded the ARP Network to expand the impact of ARS research and provide resources to help ARS commercial partners grow.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: The ARP Network matches business needs with ARS innovations and research capabilities and provides business assistance services to help companies and startups solve agricultural problems, develop products, and create new jobs. The ARP Network assists ARS in creating new partnerships and in supporting existing partnerships to advance ARS R&D efforts and subsequent utilization, including commercialization. Some of the ARP Network activities include matching industry needs with ARS patents and researchers for partnering; providing access to ARS research expertise, facilities, and equipment; and assisting in identifying sources of funding. The ARP Network is composed of organizations interested in agriculture-based economic development.														
		Website: https://www.ars.usda.gov/office-of-technology-transfer/administration-partnership/														
	ATIP	Program goals: ATIP is a national network of Department of Agriculture (USDA) federal partnership intermediaries that facilitate the transfer of USDA technologies to U.S. businesses for their research, development, and production needs to meet agriculture requirements, as well as to foster commercial applications and support U.S. economic competitiveness.														
		Program activities: ATIP leverages the skills, knowledge, and capabilities of USDA's 10 partnership intermediaries to enhance USDA's ability to transfer technology. ATIP helps USDA labs and research institutions successfully partner with the private sector for the purpose of collaborating on technology innovation and maturation. The program markets USDA technologies and capabilities and facilitates communications with the private sector. ATIP makes companies aware of both USDA-developed technologies available for commercial licensing, use, and manufacturing, and USDA's research capabilities for solving problems of the agriculture sector. ATIP also conducts market research to establish the value of licensable technologies and help ensure the license applications and commercialization plans received contain appropriate information for a decision on licensing or partnering regarding further development of a technology.														
		Website: http://atipfoundation.com/														
	I-FAST Prize Competition	Program goals: The I-FAST Prize Competition pilot program provides entrepreneurship training to USDA NIFA grantees. The competition aims to identify valuable product opportunities that can emerge from NIFA-supported academic research, to spur translation of that research to the market place, to encourage collaboration between academia and industry, and to train NIFA-funded faculty, students, and other researchers to understand innovation and entrepreneurship.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: The I-FAST Prize Competition identifies promising NIFA-funded research teams and provides them with support, in the form of mentoring, training, and funding, to accelerate the translation of fundamental research into emerging products and services that can attract subsequent third-party funding. I-FAST teams participate in a 6-month entrepreneurial immersion course provided by the NSF I-Corps program. Leveraging experience and guidance from established entrepreneurs and the NSF I-Corps curriculum, I-FAST teams learn to identify valuable product opportunities that can emerge from USDA NIFA supported academic research. The final goal of the I-FAST Prize Competition is to facilitate technology transfer of innovations that can make an impact in the marketplace and the global economy.														
		Website: https://nifa.usda.gov/program/innovations-food-and-agricultural-science-and-technology-i-fast-prize-competition														
Department of Commerce																
National Institute of Standards and Technology (NIST)	Associate Director for Innovation and Industry Services	Manufacturing USA	X			X	X				X		X	X		X
		Designated User Facilities	X		X											
		Domestic Guest Researcher (DGR) Program	X		X		X									
		Hollings Manufacturing Extension Partnership (MEP)	X	X						X	X	X	X	X		
		NIST Entrepreneurs-in-Residence (EIRs)								X		X	X			

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		NIST Science and Technology Entrepreneurship Program (N-STEP)	X						X	X		X	X	X		
Economic Development Administration (EDA)	Office of Innovation and Entrepreneurship	i6 Challenge	X			X				X	X	X	X	X		X
		Seed Fund Support (SFS) Grant									X			X		X
Program descriptions	Manufacturing USA	Program goals: Manufacturing USA aims to (1) increase the competitiveness of U.S. manufacturing; (2) facilitate the transition of innovative technologies into scalable, cost-effective, and high-performing domestic manufacturing capabilities; (3) accelerate the development of an advanced manufacturing workforce; and (4) support business models that help institutes become stable and sustainable.														
		Program activities: The program currently consists of 14 public-private partnership institutes, which are established through competed proposals requiring matching funds from the proposing partner organizations. Manufacturing USA institutes focus on moving promising, early stage research into proven capabilities ready for adoption by U.S. manufacturers. The institutes provide members with access to state-of-the-art facilities and equipment, as well as workforce training and skills development customized to support new technology areas. Each institute focuses on a specific technology area; examples include advanced fabrics, biopharmaceuticals, and integrated photonics.														
		Website: https://www.manufacturingusa.com/														
	Designated User Facilities	Program goals: Designated User Facilities aim to support U.S. industry, academic institutions, the National Institute of Standards and Technology (NIST), and other government laboratories in specific areas of research.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: NIST operates two unique laboratory facilities available for use by approved users from industry, academic institutions, NIST, and other government laboratories: (1) NIST Center for Neutron Research (NCNR); and (2) Center for Nanoscale Science and Technology (CNST). NCNR is a national user facility that provides cold and thermal neutron measurement capabilities. CNST supports the development of nanotechnology from discovery to production.														
		Website: https://www.nist.gov/labs-major-programs/user-facilities														
	DGR Program	Program goals: The DGR Program provides access to NIST facilities and equipment to nongovernment scientists to work with NIST staff on projects of mutual interest.														
		Program activities: The program provides access for technically qualified U.S. citizens to NIST facilities and equipment while working with NIST staff on projects of mutual interest. Research results are available to the public because the DGR Agreement does not provide for confidentiality of research results.														
		Website: https://www.nist.gov/tpo/guest-researchers														
	MEP	Program goals: The MEP Program's overarching mission is to strengthen and empower U.S. manufacturers. The program works primarily with small- and medium-sized U.S. manufacturers to help them create and retain jobs, increase profits, and increase and retain sales.														
		Program activities: The program consists of 51 MEP centers, one in every state and Puerto Rico, that work directly with manufacturers and their local manufacturing communities to strengthen the competitiveness of the nation's domestic manufacturing base. The public-private partnership that is the MEP National Network™ is composed of nonprofit, university-based and state economic development-based organizations, in partnership with the federal government. Each MEP center provides a variety of services to their local manufacturers, including product design and prototyping, design for manufacture/assembly, machine and equipment design, lean process improvement, and other services. Center services are fee-based and designed to be flexible and responsive.														
		Website: https://www.nist.gov/mep														
	NIST EIRs	Program goals: In partnership with the Maryland Technology Development Corporation (TEDCO), NIST EIRs are selected to provide advice and consulting to NIST scientists and tech transfer staff regarding commercialization and entrepreneurship.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: NIST EIRs hold public seminars about entrepreneurship and commercialization, and meet one-on-one with individual NIST scientists and postdocs about career opportunities in business and entrepreneurship, developing spinoffs and startup companies, and other commercialization topics. They also provide information about the potential commercial viability of new NIST inventions to assist in the patenting and licensing process.														
		Website: NA														
	N-STEP	Program goals: N-STEP aims to provide opportunities for motivated researchers to build upon the experience gained while working at NIST as they explore entrepreneurial careers.														
		Program activities: Maryland TEDCO administers the N-STEP program, which will offer grants to current and former NIST researchers for technology development and commercialization of NIST technologies. The NIST Technology Partnerships Office (TPO) identifies inventions available for licensing that are most appropriate for commercialization, especially by startup and early-stage firms. TEDCO and local economic development organizations help the researchers create startup companies to license and commercialize NIST's inventions. In addition to the funding, NIST and TEDCO will make available a variety of resources, including entrepreneurship training, mentoring, and other resources.														
		Website: http://tedco.md/program/n-step/														
	i6 Challenge	Program goals: The i6 program supports innovation, entrepreneurship, innovative regional economic development, and commercialization of research. Supported projects must focus on one or more of these aims.														
		Program activities: The i6 Challenge is one of the two competitions supported by the Regional Innovation Strategies (RIS) Program. The i6 Challenge provides grants to support the creation of centers for innovation and entrepreneurship that increase the rate at which innovations, ideas, intellectual property, and research are translated into products, services, viable companies, and, ultimately, jobs. The i6 grantees offer a range of services to client companies, including events, networking, and referrals; mentoring, coaching, and technical assistance; access to facilities and equipment; technology development support; and financing support.														
		Website: https://www.eda.gov/oie/ris/i6/														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	SFS Grant	Program goals: SFS grants aim to increase the availability of early stage risk capital, in the form of seed funds, in regions around the country by providing funding for technical assistance to support the creation, launch, or expansion of equity-based, cluster-focused seed funds that invest regionally-managed risk capital in regionally-based startups with a potential for high growth.														
		Program activities: The SFS Grant is one of the two competitions supported by the RIS Program. This initiative provides funding for new and existing equity-based seed fund programs (e.g., technical assistance, feasibility studies, or marketing related to the operation) that (1) provide early stage capital support for new businesses (generally less than three years old), (2) have a sustainability plan based on taking equity stakes in the businesses in which the program invests, and (3) demonstrate ecosystem and downstream funding support. SFS Grants provide a maximum of $250,000 in funding and require a minimum of 1:1 matching funds.														
		Website: https://www.eda.gov/oie/ris/														
Department of Defense																
Department Wide		Manufacturing Technology (ManTech) Program	X		X				X							
		Commercial Readiness Program (CRP)	X		X	X				X	X		X			
Department of the Army		Army Venture Capital Initiative (AVCI)		X	X											X
	Army Research Lab (ARL)	Open Campus Iniative	X				X									

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
Department of the Navy		Navy Small Business Innovation Research (SBIR)/ Small Business Technology Transfer (STTR) Transition Program (STP)								X	X	X	X			
	Naval Surface Warfare Center, Crane Division (NSWC Crane)	Innovation Discovery Process							X		X	X				
Department of the Air Force		New York Furnace Technology Transfer Accelerator (NY Furnace)							X	X	X	X				
Office of the Secretary of Defense	Office of the Under Secretary of Defense for Acquisition, Technology and Logistics	Joint Capability Technology Demonstration (JCTD)	X		X						X					

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Rapid Reaction Fund	X		X	X										
	Office of the Assistant Secretary of Defense for Research & Engineering	I-Corps @ DoD								X	X	X		X		
	Defense Advanced Research Projects Agency (DARPA)	SBIR/STTR Transition & Commercialization Support Program (TCSP)								X	X	X	X			
		Defense Innovation Unit Experimental (DIUx)		X	X											X
		MD5 National Security Technology Accelerator (MD5)	X	X	X	X			X	X	X	X	X	X		

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
Program descriptions	ManTech Program	Program goals: The Defense-Wide Manufacturing Science & Technology (DMS&T) ManTech Program was established to address cross-cutting, game-changing initiatives that are beyond the scope of any one Military Department or Defense Agency.														
		Program activities: ManTech seeks to address defense manufacturing needs, transition manufacturing R&D processes into production applications, attack manufacturing issues, and explore new opportunities.														
		Website: https://www.dodmantech.com/														
	CRP	Program goals: Part of the Department of Defense's (DoD) SBIR/STTR program, the purpose of the CRP is to accelerate the transition of SBIR and STTR funded technologies to Phase III, especially those that lead to programs of record and fielded systems.														
		Program activities: The CRP enhances the connectivity among SBIR and STTR firms, prime contractors, and DoD science & technology and acquisition communities. It also improves an SBIR or STTR firm's capability to provide the identified technology to the Department, directly or as a subcontractor.														
		Website: http://www.acq.osd.mil/osbp/sbir/sb/crp.shtml														
	AVCI	Program goals: AVCI aims to accelerate product development and efficiently deliver breakthrough, war-winning capabilities through investments in venture-funded companies developing innovative technologies of significant interest to the warfighter that are traditionally beyond the reach of the DoD.														
		Program activities: AVCI is the venture activity of the U.S. Army and DoD that strategically invests in cutting-edge technologies. The model helps build sustainable solutions and is powered by investing along with venture capital firms. AVCI focuses on technologies addressing the needs of the commercial market that will also meet priority warfighter needs. For each dollar AVCI invests in a company, the venture community, on average, invests more than $22. AVCI's model offers a complement to traditional acquisition and uses a proven commercial investment methodology that results in faster solution identification, product development, continuous enhancements, and is often accompanied by lower costs to the DoD.														
		Website: http://armyvci.org/														
	ARL Open Campus Iniative	Program goals: ARL's Open Campus Initiative is a collaborative endeavor, with the goal of building a science and technology ecosystem that will encourage groundbreaking advances in basic and applied research areas of relevance to the Army.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: Through the Open Campus framework, ARL scientists and engineers work collaboratively and side-by-side with visiting scientists in ARL's facilities, and as visiting researchers at collaborators' institutions. Central to the research collaborations is mutual scientific interest and investment by all partners – ARL's Open Campus is not a funding opportunity.														
		Website: www.arl.army.mil/www/default.cfm?page=2357														
	Navy STP	Program goals: The Navy STP provides commercialization, transition, and professional business assistance through a structured program so that participating small businesses are in the best position to obtain Phase III funding.														
		Program activities: The program takes a holistic approach to assisting selected small businesses to identify and plan a path to obtain Phase III funding for commercialization of their SBIR/STTR-developed technology(s) and transition their technology(s) through business mentoring, training, marketing material creation, and business development activities and promotion. STP provides a range of support for selected companies, including providing relevant market research appropriate to the Small Business's technology and transition targets, identifying leads for potential transition opportunities, promoting their technology(s) on the Virtual Transition Marketplace (VTM—an online, searchable showcase accessible to Government and private sector), and others.														
		Website: https://navystp.com/														
	NSWC Crane Innovation Discovery Process	Program goals: The primary goal of the NSWC Crane Innovation Discovery Process is to help researchers identify potential intellectual property.														
		Program activities: The NSWC Crane Innovation Discovery Process involves "Innovation Mining" events where inventors discuss their research projects in front of business and engineering faculty, entrepreneurs, and industry and technology transfer experts who help identify potential invention disclosures and commercialization ideas concurrently.														
		Website: NA														
	NY Furnace	Program goals: The aim of NY Furnace is to form, fund, and launch startups that will license and successfully commercialize one or more Air Force technologies.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: DoD made Air Force inventions available to entrepreneurs through state-wide competitions; those entrepreneurial teams selected then participated in a follow-on startup acceleration program called NY Furnace. DoD partnered with Arizona State University's (ASU) Pracademic Center of Excellence in Technology Transfer (PACE/T2), the developers of the furnace system, to support the transfer and commercialization of discoveries from the country's top research laboratories.														
		Website: http://www.azte.com/for-startups/acceleration														
	JCTD	Program goals: The mission of the JCTD Program is to execute pre-engineering and manufacturing development (pre-EMD) and fieldable prototypes through operational demonstrations of game-changing technologies to meet DoD strategic needs while addressing Joint Force and Combatant Commands capability gaps.														
		Program activities: JCTD has four main activities: (1) stimulating innovation by providing a collaborative environment between government, industry and academia and providing a bridge from science and technology to operational use and acquisition; (2) reducing technical risk through the use of experimentation and prototyping and reducing operational risk by conducting operational demonstrations with the warfighter; (3) enabling affordability by providing open architecture to enhance interoperability and minimizing design changes and surprises during the EMD phase of acquisition; and (4) accelerating the acquisition process.														
		Website: http://www.acq.osd.mil/ecp/PROGRAMS/JCTD.html														
	Rapid Reaction Fund	Program goals: The Rapid Reaction Technology Office (RRTO) uses the Rapid Reaction Fund to develop and demonstrate less mature, high-reward technologies that produce game-changing capabilities by leveraging nontraditional sources of innovation, interagency partnerships, and rapid prototyping.														
		Program activities: RRTO uses the fund to develop prototypes and host technology demonstrations to counter emerging and anticipated threats in order to accelerate the delivery of resilient solutions leading to affordable warfighter capabilities. RRTO achieves its mission through partnerships with combatant commands, Service labs, Defense Department offices, other government agencies, the commercial sector, and academia.														
		Website: www.acq.osd.mil/ecp/PROGRAMS/RRTO.html														
	I-Corps @ DoD	Program goals: I-Corps @ DoD aims to commercialize the outputs of basic research funded by the DoD, develop a more entrepreneurial mindset among DoD-funded researchers, and better align DoD basic research efforts with the needs of the defense community and commercial markets.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: The I-Corps @ DoD Pilot Program partners with NSF's I-Corps program to provide entrepreneurial education to DoD-funded researchers. Funded researchers conduct 100 interviews with potential customers using lean startup methods in order to learn more about problems that commercial stakeholders want to have solved. The training is directed by experienced entrepreneurs who teach researchers about value propositions, business plans, and other concepts essential to commercialization.														
		Website: http://basicresearch.defense.gov/														
	SBIR/STTR TCSP	Program goals: The DARPA SBIR/STTR TCSP aims to maximize the potential for SBIR/STTR companies to move their technology beyond Phase II, and into other R&D programs for further maturity, or into solutions or products for DoD acquisition programs, other federal programs, and/or the commercial market.														
		Program activities: For SBIR/STTR Phase I awardees, the program provides information on how to continue transition and plan for commercialization. For Phase II awardees, the program reviews and provides feedback to the company on their transition and commercialization plan; identifies potential sources of funding and collaborators, experiment and demonstration opportunities, thought leadership opportunities, and media and publication sources; facilitates introductions to potential funders, collaborators, and partners; and provides business planning and assessment tools, in addition to providing other resources.														
		Website: https://www.darpa.mil/work-with-us/for-small-businesses/commercialization-continued														
	DIUx	Program goals: DIUx aims to accelerate commercial innovation for national defense by building relationships between the high-technology commercial sector and DoD customers.														
		Program activities: DIUx provides non-dilutive capital to companies to work on new technologies to solve DoD problems. DIUx operates nationwide, with headquarters in Silicon Valley and offices in Boston, Austin, and the Pentagon.														
		Website: https://diux.mil/														
	MD5	Program goals: MD5 seeks to (1) accelerate capability development leveraging non-traditional collaborators and "bottom-up" approaches, (2) augment the defense industry through the creation of startup businesses responsive to national security problems, and (3) enhance the DOD workforce through critical innovation skills development.														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: MD5 executes three portfolios of effort: Education promotes workforce development cultivating innovators and intrapreneurs inside DoD (Hacking for Defense, JPME, innovation boot camps, and industry fellowships); Collaboration connects communities of innovators around problems and technologies relevant to national security to enable formation of new ventures (Hackathons, Innovation Challenges, Startup Showcases, and Fed Tech); and Acceleration grows and matures civil-military technology ventures by ensuring that innovators can access critical resources, including DoD R&D infrastructure, to build, test, and enhance venture concepts (Proof-of-Concept Centers, Fulcrum, Hard Tech Studio/Innovator-in-Residence, and Defense Innovation Proving Ground).													
		Website: www.md5.net/														
Department of Energy																
Advanced Research Projects Agency-Energy (ARPA-E)		Tech-to-Market (T2M) Program							X	X	X	X	X			
Office of the Under Secretary for Science and Energy	Office of Energy Efficiency and Renewable Energy (EERE)	Small Business Vouchers (SBV)	X			X							X			
		Cleantech University Prize (Cleantech UP)	X				X			X		X		X		X
		National Incubator Initiative for Clean Energy (NIICE)	X							X	X	X	X			

Agency	Office	Program	Science and technology development							Enterprise development						
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		Build4Scale Manufacturing Training for Cleantech Entrepreneurs (Build4Scale)	X							X			X			
		Energy I-Corps (Lab-Corps)								X	X	X		X		
		Incubatenergy Network									X		X			
		Lab-Embedded Entrepreneurship Program	X							X	X					
		Technologist in Residence (TIR) Program	X	X	X				X		X					
		SunShot Incubator	X			X				X	X	X	X			
		SunShot Technology-to-Market (T2M) Initiative	X			X				X	X	X	X			X

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	Office of Science	Argonne National Laboratory Nano Design Works (ADW)	X													
		Argonne Collaborative Center for Energy Storage Science (ACCESS)	X													
		Argonne National Laboratory Chain Reaction Innovations (CRI)	X				X				X	X	X			X
		Innovation Crossroads	X			X				X	X	X	X			X
		Lawrence Berkeley National Laboratory Cyclotron Road	X						X							X

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		Oak Ridge National Laboratory (ORNL) SPARK!			X						X					
		ORNL Bridging the Gap							X		X					
		ORNL Institute for Advanced Composites Manufacturing Innovation (IACMI)	X								X		X			
		Pacific Northwest National Laboratory Mentor-Protégé Program (MPP)								X		X				
		Pacific Northwest National Laboratory Entrepreneur Support Catalog									X					

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	Office of Nuclear Energy	Gateway for Accelerated Innovation in Nuclear (GAIN)	X								X					
	Office of Technology Transitions	Energy Investment Center (EIC)									X		X			X
		Technology Commercialization Fund (TCF)	X			X			X		X					
Office of the Under Secretary for Nuclear Security and National Nuclear Security Administration	National Nuclear Security Administration	Center for Collaboration and Commercialization (C3)	X						X	X	X	X	X			
		Livermore Valley Open Campus (LVOC)	X				X				X					
Program descriptions	T2M Program	Program goals: The ARPA-E T2M Program aids ARPA-E in transitioning energy technologies from the laboratory towards real-world application. The T2M Program team helps create impact opportunities for funded projects across all ARPA-E program areas.														

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		Program activities: Once a project team has crafted a tech-to-market plan, the ARPA-E T2M team works to align their resources and efforts towards the wants and need of potential technology transition partners. They do this through a range of activities, including providing awardees with market knowledge; providing resources on commercialization best practices; identifying and connecting awardees to strategic opportunities and resources; maintaining and cultivating a strong network across the market/industry; presenting and highlighting ARPA-E projects and technologies to stakeholders across the ecosystem; and identifying and working to mitigate shared obstacles for fielding new energy technologies (regulatory, ecosystem, standards, etc.).														
		Website: https://arpa-e.energy.gov/?q=site-page/tech-market-t2m														
	SBV	Program goals: SBVs help small businesses overcome challenges with prototyping, materials characterization, high-performance computations, modeling and simulations, and validation of technology performance by providing them access to national labs. At the same time, the program increases national lab awareness of the challenges small businesses face in the energy sector.														
		Program activities: Through the SBV program, eligible small businesses can tap into the reserve of national laboratory intellectual and technical assets to overcome critical technology challenges, including prototyping, materials characterization, high performance computations, modeling and simulations, intermediate scaling to generate samples for potential customers, validation of technology performance, and designing new ways to satisfy regulatory compliance. The SunShot Initiative funds vouchers for solar projects under the SBV program, which are valued between $50,000 and $300,000 each.														
		Website: https://energy.gov/eere/technology-to-market/small-business-vouchers														
	Cleantech UP	Program goals: Cleantech UP inspires and equips the next generation of clean energy entrepreneurs and innovators by providing them with competitive funding for business development and commercialization training and other educational opportunities.														
		Program activities: Eight institutions across the country host annual Cleantech UP Collegiate Competitions, where students receive entrepreneurial support and compete for cash prizes and services to further support the commercialization of their clean energy technologies. The Collegiate Competitions establish team development and training that will aid students in developing the skills to move clean energy technologies from the discovery phase to the marketplace. Winners of the Collegiate Competitions are eligible to compete in the Cleantech UP National Competition run by the Hub. The National Competition, which is the culmination of the Collegiate Competitions, awards an additional $100,000 in prizes.														

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		Website: https://energy.gov/eere/technology-to-market/cleantech-university-prize-cleantech														
	NIICE	Program goals: NIICE aims to increase coordination and collaboration among incubators across the country and develop best practices to raise incubator performance standards. This effort enables incubators to provide more efficient and effective services to early-stage U.S. companies.														
		Program activities: Through NIICE, EERE funds the first nationwide support organization to connect and build a community of cleantech-focused startup incubators. This network is a community of U.S. clean energy-focused business incubators nationwide that have supported almost 500 companies to date. NIICE also funds several regional cleantech incubators to run programs with commercialization services for startups including mentorship, business development, capital access, and testing and demonstration. These incubators work with the national organization to develop best practices for clean energy incubators that can be replicated nationwide.														
		Website: https://energy.gov/eere/technology-to-market/national-incubator-initiative-clean-energy-niice-0														
	Build4Scale	Program goals: Build4Scale provides entrepreneurs with the tools they need to identify and address manufacturing challenges early in the process. The development of the Build4Scale training was informed by the "Manufacturing 101: An Education and Training Curriculum for Hardware Entrepreneurs" report developed by MForesight.														
		Program activities: Build4Scale trains cleantech entrepreneurs on the fundamentals of manufacturing, providing them with the tools and information they need to bring their promising energy solutions to market. The Build4Scale training "tool-kit" includes training for making and evaluating manufacturing-related decisions, understanding product design and development, self-assessment for manufacturing readiness, and basics of manufacturing processes. Lawrence Livermore National Laboratory (LLNL) led the development of the Build4Scale training. LLNL collaborated with more than a dozen partners to develop the training, leveraging their strengths in key areas, including technical knowledge, training module development, and resource networks.														
		Website: https://energy.gov/eere/technology-to-market/build4scale-manufacturing-training-cleantech-entrepreneurs														
	Energy I-Corps	Program goals: Energy I-Corps aims to accelerate the commercialization of clean energy technologies from the Department of Energy (DOE) national laboratories by utilizing the NSF's I-Corps model. I-Corps is an intensive, structured, and curriculum-based program designed to educate early stage technology developers on business model development and the value of customer discovery.														

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		Program activities: Energy I-Corps pairs teams of researchers with industry mentors for an intensive two-month training where the researchers define technology value propositions, conduct customer discovery interviews, and develop viable market pathways for their technologies. Researchers return to the lab with a framework for industry engagement to guide future research and inform a culture of market awareness within the labs. Energy I-Corps is managed by DOE's National Renewable Energy Laboratory (NREL), which leads curriculum development and execution, recruits program instructors and industry mentors, and assembles teams from 10 national labs.														
		Website: https://energy.gov/eere/technology-to-market/energy-i-corps														
	Lab-Embedded Entrepreneurship Program	Program goals: The Lab-Embedded Entrepreneurship Program provides an institutional home for researchers to build their research into products and train to be entrepreneurs.														
		Program activities: The Lab-Embedded Entrepreneurship Program takes top entrepreneurial scientists and engineers and embeds them within the U.S. national laboratories to perform applied R&D with the express goal of launching a clean energy business. In addition to technological access and support, the program trains innovators to develop entrepreneurial acumen and skills, while introducing them to the ecosystem partners needed to facilitate commercial and investment opportunities. This dual focus on R&D and entrepreneurial development provides innovators with the platform they need to take their ideas from the lab and onto the commercialization pathway.														
		Website: https://energy.gov/eere/technology-to-market/lab-embedded-entrepreneurship-program														
	TIR Program	Program goals: The goals of the TIR program are to (1) increase collaborative R&D between national laboratories and private sector companies; and (2) develop a streamlined method for companies to establish long-term relationships with national laboratories that result in collaborative R&D.														
		Program activities: The TIR program is designed to streamline engagement and increase collaborative R&D between national labs and private sector companies. The program competitively selects "technologist pairs" – a senior technical staff member from a national lab and a counterpart senior technical staff member from a manufacturing company or consortium of companies – that focus on building strong new R&D relationships between the respective companies and national labs. These partnerships focus on identifying the challenges of interest, and applicable resources and capabilities within the national labs; proposing collaborative R&D solutions; and developing an agreement and scope of work that would address one or more identified challenges.														

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		Website: https://energy.gov/eere/cemi/technologist-residence-program														
	SunShot Incubator	Program goals: The SunShot Incubator aims to shorten the time it takes for a young business or company to develop an innovative product concept and make it commercially available, which includes product prototyping, deployment, and, potentially, manufacturing. Most projects are cooperative agreements that last from 12 to 18 months with payment made upon completion and verification of aggressive project deliverables.														
		Program activities: The SunShot Incubator program provides early-stage assistance to help startup companies cross technological barriers to commercialization while encouraging private sector investment. By taking innovations and putting them through a rigorous de-risking process, the Incubator program allows entrepreneurs to focus on rapid commercialization. Early-stage Incubator assistance enables startup businesses to cross critical technological barriers that the investment community is unable to address. Once these key risks are addressed, the startup businesses are ideally suited for private follow-on funding and success.														
		Website: https://energy.gov/eere/sunshot/sunshot-incubator-program														
	SunShot T2M Initiative	Program goals: The projects funded by the SunShot T2M subprogram aim to catalyze the continued development of the U.S. solar market and the continued expansion of U.S. manufacturing of solar products in order to achieve the 2020 SunShot goals. The T2M Initiative targets two funding gaps for energy technologies: those that occur at the prototype commercialization stage and those at the commercial scale-up stage.														
		Program activities: There are four main funding programs under the SunShot T2M Initiative, each of which addresses innovations in technology development, supply chain, and/or manufacturing. The four main T2M funding programs are: (1) SunShot's Incubator program, which provides early-stage assistance to companies; (2) SBIR and STTR programs which encourage U.S.-based small businesses to engage in R&D; (3) the Solar Manufacturing Technology (SolarMaT) program, which funds the development of manufacturing technologies; and (4) the SunShot Photovoltaic Manufacturing Initiative (PVMI), which focuses on manufacturing R&D projects.														
		Website: https://energy.gov/eere/sunshot/technology-market														
	ADW	Program goals: ADW provides services to strengthen the impact and support the acceleration of discoveries to market, helping the U.S. remain a leader in global nanotechnology.														

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		Program activities: ADW provides a central point of contact for companies—ranging from large industrial entities to smaller businesses and startups, as well as government agencies—to benefit from Argonne National Lab's world-class expertise, scientific tools and facilities in the field of nanotechnology. Argonne National Lab has the capacity to fully comprehend the function of materials in three key areas: (1) fabrication and synthesis, (2) characterization of nanoscale materials, and (3) predictive understanding through modeling and simulation.														
		Website: https://argonnedesignworks.anl.gov/														
	ACCESS	Program goals: ACCESS helps public and private-sector customers solve energy storage problems through multidisciplinary research.														
		Program activities: ACCESS provides a central point of contact for companies to benefit from Argonne National Lab's world-class expertise, scientific tools, and facilities in the field of energy storage. ACCESS assembles collaborative teams drawn from Argonne National Lab's 1,400 scientists and engineers, who represent dozens of disciplines, to help clients in several key areas related to energy storage, including discovery of new materials and properties, materials characterization, process scale-up, process and systems modeling, cell fabrication, and performance testing.														
		Website: https://access.anl.gov/														
	Argonne National Laboratory CRI	Program goals: Argonne National Laboratory CRI identifies innovators with ideas for energy- and science-based technologies that can have a significant impact on the lives of billions of people.														
		Program activities: CRI is a two-year program for innovators focusing on energy and science technologies. Program participants receive the financial and technical support needed to mature nascent technologies that face long development cycles to the proof-of-concept level. CRI gives teams of innovators a two-year runway to develop and scale their technologies while being supported through fellowship funding that covers salary, benefits, and use of laboratory equipment and office space. Through partnerships with mentor organizations, CRI participants get assistance developing business strategies, conducting market research, and finding long-term financing and potential commercial partners. CRI is one of the Lab-Embedded Entrepreneurship Programs.														
		Website: https://chainreaction.anl.gov/														
	Innovation Crossroads	Program goals: Through Innovation Crossroads, ORNL matches aspiring energy entrepreneurs with technology leaders, experienced mentors, and business and investment networks in technology-related fields that can help accelerate the transition of their world-changing ideas to the marketplace.														

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		Program activities: Through an annual call, the Innovation Crossroads program selects up to five entrepreneurs to help transform their ideas into energy and advanced manufacturing companies with financial support from the DOE's EERE. Innovators receive a fellowship that covers living costs, benefits and a travel stipend for up to two years, plus up to $350,000 to use on collaborative research and development at ORNL. Each innovator is also paired with a doctoral student from the University of Tennessee's Bredesen Center for Interdisciplinary Research and Graduate Education for assistance with market research and customer discovery.														
		Website: https://innovationcrossroads.ornl.gov/														
	Lawrence Berkeley National Laboratory Cyclotron Road	Program goals: Cyclotron Road aims to empower scientists to advance hard technologies from concept to viable first product, positioning them for broad societal impact in the long term.														
		Program activities: Cyclotron Road's Cohort Program is a two-year fellowship that supports scientists developing energy technologies that have potential for broad impact on the national, economic, and energy security of the U.S. Cohort innovators spend two years embedded at Lawrence Berkeley National Laboratory with an explicit mandate to bring their ideas to the point of commercial viability. Cyclotron Road participants receive access to facilities, equipment, and expertise at Lawrence Berkeley National Laboratory, as well as a small amount of initial research funding to facilitate access and collaboration with the Lab's staff scientists. Innovators fully own or jointly own all intellectual property developed during the program. Cyclotron Road is one of the Lab-Embedded Entrepreneurship Programs.														
		Website: http://www.cyclotronroad.org/														
	ORNL SPARK!	Program goals: SPARK! events aim to showcase ORNL's most promising technologies and get industry feedback on those technologies.														
		Program activities: SPARK! is an annual event at which some of ORNL's most promising technologies for commercialization are presented to a small group of entrepreneurs, investors, and industry experts, who provide valuable feedback about potential market applications and collaborators.														
		Website: https://www.ornl.gov/partnerships/entrepreneurial-development-programs														
	ORNL Bridging the Gap	Program goals: Bridging the Gap events showcase ORNL's most promising technologies that are available to licensing or other types of agreements.														
		Program activities: Bridging the Gap events showcase ORNL's most promising technologies to a wide range of people from various industries. During the events, participants can also meet with ORNL researchers, and tour labs and other facilities.														

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		Website: https://www.ornl.gov/partnerships/entrepreneurial-development-programs														
	ORNL IACMI	Program goals: IACMI aims to increase domestic production capacity, grow manufacturing, and create jobs across the U.S. composite industry.														
		Program activities: IACMI, managed by the Collaborative Composite Solutions Corporation (CCS), is a partnership of industry, universities, national laboratories, and federal, state, and local governments working together to benefit the nation's energy and economic security by sharing existing resources and co-investing to accelerate development and commercial deployment of advanced composites. CCS is a not-for-profit organization established by The University of Tennessee Research Foundation. IACMI partners focus on accelerating development and adoption of cutting-edge manufacturing technologies for low-cost, energy-efficient manufacturing of advanced polymer composites for vehicles, wind turbines, and compressed gas storage.														
		Website: https://www.ornl.gov/partnerships/iacmi														
	Pacific Northwest National Laboratory MPP	Program goals: MPP assists in the creation, stabilization, and growth of regional technology-based businesses by providing a network of individuals experienced in business (mentors) able and willing to provide guidance to regional companies/individuals (protégés).														
		Program activities: Potential protégés initiate the process by requesting a mentor for a specific business challenge. Through the MPP, protégés are introduced to one or more qualified mentors, who will assist them for an agreed upon period (typically 6–24 months). Mentors and protégés may continue their relationship independent of the MPP following completion of the formal mentoring engagement. In general, protégés receive the obvious benefit of learning from a mentor's experience. They may also receive specific assistance in things like writing business and sales plans, uncovering new market opportunities for products and services, preparing financial projections, and others.														
		Website: http://www.pnnl.gov/edo/mentor/														
	Pacific Northwest National Laboratory Entrepreneur Support Catalog	Program goals: The Entrepreneur Support Catalog provides an online database to help small businesses and entrepreneurs in the Tri-Cities, Washington area find support to prosper and grow. It is also intended to help the economic development organizations listed make referrals to other organizations.														
		Program activities: The Entrepreneur Support Catalog is an online database of economic development and entrepreneurial support organizations. All of the information in the Entrepreneur Support Catalog is added and maintained by the organizations listed. The database contains information about not-for-profit organizations only, although some of the organizations listed will make referrals to for-profit organizations (e.g., accountants) as appropriate.														

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		Website: http://www.pnnl.gov/edo/Default.aspx?topic=Entrepreneur_Support_Catalog														
	GAIN	Program goals: GAIN provides the nuclear energy community with access to the technical, regulatory, and financial support necessary to move new or advanced nuclear reactor designs toward commercialization while ensuring the continued safe, reliable, and economic operation of the existing nuclear fleet.														
		Program activities: GAIN provides the nuclear community with a single point of access to the broad range of capabilities – people, facilities, materials, and data – across the DOE complex and its National Lab capabilities. Focused research opportunities and dedicated industry engagement are also important components of GAIN, ensuring that DOE-sponsored activities are impactful to companies working to realize the full potential of nuclear energy. The capabilities accessible through GAIN include experimental capabilities, with primary emphasis on nuclear and radiological facilities; computational capabilities; information and data; and land use and site information for demonstration facilities.														
		Website: https://gain.inl.gov/SitePages/Home.aspx														
	EIC	Program goals: The EIC builds bridges to the private sector to facilitate the public-private partnerships needed to unshackle domestic innovation and assert U.S. leadership in the global energy technology race and marketplace that is fast-developing around the world.														
		Program activities: EIC assists and supports investors and businesses by providing a one-stop-shop to get connected with world-leading energy experts, acquire the latest research studies and reports, and identify promising funding opportunities and promising energy products. EIC offers: (1) Laboratory-Investor Knowledge Series (LINKS), which coordinate meetings across the country between DOE labs and with investors to discuss partnership opportunities; (2) Laboratory Partnering Service (LPS), an online platform that enables access to energy experts within the DOE national laboratory network; (3) Innovation Interface (I2), a forum for information exchange between investors and DOE program managers; and (4) Technical Assistance.														
		Website: https://energy.gov/technologytransitions/us-department-energys-energy-investor-center														
	TCF	Program goals: TCF aims to (1) increase the number of energy technologies developed at DOE's national labs that graduate to commercial development and achieve commercial impact, and (2) enhance DOE's technology transitions system with a forward-looking and competitive approach to lab-industry partnerships.														

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		Program activities: The TCF is a nearly $20 million funding opportunity that leverages the R&D funding in applied energy programs to mature promising energy technologies with the potential for high impact. These funds are matched with funds from private partners to promote promising energy technologies for commercial purposes. There are three key areas within DOE where the TCF enhances technology transitions efforts: (1) national lab technology maturation; (2) strategic CRADA (Cooperative Research and Development Agreement) approach to increase commercial impact; and (3) focused industry engagement to identify high-quality partners.														
		Website: https://energy.gov/technologytransitions/services/technology-commercialization-fund														
	C3	Program goals: The proposed C3 will serve as a public face for Sandia National Laboratories, facilitating access to the Labs and building linkages with the community.														
		Program activities: Located in the Sandia Science & Technology Park (SS&TP), C3 will be a multi-tenant facility dedicated to increasing Sandia's collaboration and commercialization activities. C3 will offer spaces for lease along with programs and services for tenants and partners, all designed to facilitate successful partnerships. C3 will offer many programs and services, including: Entrepreneur Training, Small Business Assistance, Interactive Intellectual Property Library, Tech Maturation, Investor Access, Scientific and Technical Consulting, Technology Showcase, and Mentors.														
		Website: https://sstp.org/c3														
	LVOC	Program goals: LVOC creates a novel venue for collaborations between experts from Lawrence Livermore National Laboratory and Sandia National Laboratories and experts outside the labs.														
		Program activities: LVOC is an innovation hub along the boundaries of Lawrence Livermore National Laboratory and Sandia National Laboratories. LVOC is an open, unclassified R&D space intended to foster research on current and future national security challenges in areas such as high performance computing, energy and environmental security, cybersecurity, economic security, and non-proliferation. Modeled in part after research and development campuses found at major industrial research parks and other DOE laboratories, LVOC has a set of business and operating rules devised to enhance and accelerate international scientific collaboration and partnerships with U.S. government agencies, industry, and academia.														
		Website: https://lvoc.org/														
Department of Health and Human Services																

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National Institutes of Health (NIH)	Office of the Director	Commercialization Accelerator Program (CAP)								X	X	X	X			
		I-Corps at NIH								X	X	X		X		
		Niche Assessment Program											X			
		Neuro Startup Challenge		X					X					X		X
	National Heart Lung and Blood Institute (NHLBI)	NIH Centers for Accelerated Innovations (NCAI)	X			X				X	X	X	X	X		
		Research Evaluation and Commercialization Hubs (REACH)	X			X				X	X	X	X	X		
		SBIR Phase IIB Bridge Award	X			X					X					
		SBIR Phase IIB Small Market Award	X			X					X					

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	National Cancer Institute (NCI)	SBIR Phase IIB Bridge Award									X					X
		SBIR Federal Resources for Accelerating Commercialization (FRAC) Workshop								X	X	X				
		Breast Cancer Startup Challenge		X					X					X		X
		Nanotechnology Startup Challenge in Cancer		X					X					X		X
		Invention Development Program	X	X		X										
	National Center for Advancing Translational Sciences (NCATS)	Therapeutics for Rare and Neglected Diseases (TRND)	X													

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Bridging Interventional Development Gaps (BrIDGs)	X													
Centers for Disease Control and Prevention (CDC)	Office of the Director	Innovation Fund (iFund)	X			X				X						
		Ideation Catalyst (I-Catalyst)								X		X		X		
Program descriptions	CAP	Program goals: The NIH CAP mentors and assists the agency's most promising small life science and healthcare SBIR/STTR Phase II awardees in developing commercial businesses and transitioning SBIR/STTR-funded technologies into the marketplace.														
		Program activities: Offered annually, CAP provides selected participants with individualized assistance toward accomplishing key commercialization goals. The program assists participants in evaluating commercialization options based on their specific technologies (including the need and prospect for investment, strategic partnerships, or licensing) and in developing an 18-month market-entry plan. This is achieved through individual mentoring and consulting sessions, training workshops, access to domain experts, and focus on outcomes that will enhance the commercialization profile and readiness of participating awardees. The program is customized to meet the needs of participating companies in three distinct tracks: (1) Commercialization Transition Track (CTT) for emerging companies, (2) Advanced Commercialization Track (ACT), and (3) Regulatory/Reimbursement Training Track (RTT) for "seasoned" companies.														
		Website: https://sbir.nih.gov/cap														
	I-Corps at NIH	Program goals: Based on the NSF I-Corps program, I-Corps at NIH provides participants with real-world, hands-on entrepreneurship training in the life science and biotechnology sectors in order to accelerate the translation of innovations from the lab to clinical practice.														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: I-Corps at NIH is offered to SBIR/STTR funded academic researchers and small businesses from across 17 NIH and CDC Institutes/Centers. Project teams include: (1) a C-Level Corporate Officer with decision-making authority; (2) an individual with a business development background in the target industry; and (3) the assigned PD/PI on the SBIR/STTR Phase I award. Selected teams receive funding through grant supplement awards to support entrepreneurial training, mentorship, and collaboration opportunities that assist them in translating their research ideas into viable products and overcoming key obstacles along the path of innovation and commercialization. At the beginning of the training program, the project teams attend an evening reception and intensive, 3-day "Entrepreneurial Immersion" course. Project teams then participate in an 8-week I-Corps training curriculum administered via online instruction. At the end of the course, each team attends a 2-day report-out session.													
		Website: https://sbir.cancer.gov/programseducation/icorps														
	Niche Assessment Program	Program goals: The Niche Assessment Program provides small businesses with market insight and data to help them strategically position their technology in the marketplace.														
		Program activities: Technology Niche Analyses assess potential applications for a technology and then for one viable application, it provides an assessment of the: (1) needs and concerns of end-users; (2) competing technologies and competing products; (3) competitive advantage of the SBIR/STTR-developed technology; (4) market size and potential market share (may include national and/or global markets); (5) barriers to market entry (may include but is not limited to pricing, competition, government regulations, manufacturing challenges, capital requirements, etc.); (6) market drivers; (7) status of market and industry trends; (8) potential customers, licensees, investors, or other commercialization partners; and (9) the price customers are likely to pay.													
		Website: https://sbir.nih.gov/nap														
	Neuro Startup Challenge	Program goals: The Neuro Startup Challenge was a multi-phase business plan competition that leveraged NIH's significant portfolio of inventions available for licensing.														

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		Program activities: The Center for Advancing Innovation (CAI) evaluated NIH's portfolio to identify those inventions with the strongest commercial viability. These inventions were eligible for use in the Neuro Startup Challenge. The Neuro Startup Challenge involved four phases. In Phase 0, teams outlined their intent to participate in the Neuro Startup Challenge by providing information regarding the invention they would develop their business plan around, details and backgrounds of the members of their team, and how team members met eligibility requirements. In Phase 1: Elevator Speech, teams developed a two-minute elevator speech via recorded video; a 350-word executive summary outlining potential commercial product(s); and a company vision. Winners of the phase moved on to Phase 2: Business Plan, in which the teams developed a 10-page business plan with a detailed financial plan and presented a 20 minute "live" pitch to the challenge judges. Winners of this phase received a $2500 award as well as moved on to Phase 3: Startup. In Phase 3, teams launched their startups, including incorporation, applying for licenses, and executing other regulatory/developmental needs.													
		Website: http://www.neurostartupchallenge.org/														
	NCAI	Program goals: The NCAIs address the gap in the commercialization pipeline between scientific discovery and company formation in order to more rapidly and effectively move breakthrough innovations to available products with health, economic, and societal impact.														
		Program activities: NCAIs are unique public-private partnerships featuring expertise and resources from the federal government, academia, and the private-sector that change the way discoveries with scientific and commercial potential are identified and developed. NCAIs support proof-of-concept studies, educate academics on the technology development process, and provide early access to the scientific and business expertise needed for commercialization. NCAIs provide early mentoring to innovators to develop key business elements (legal, business development, regulatory, reimbursement, access to partners and capital). NCAIs address the knowledge and funding gaps for the early steps needed to translate novel discoveries and technologies into new diagnostics, devices, therapeutics, and tools for patient care by providing pilot funding, based upon a review process for scientific merit and commercial potential; resources and expertise, including business plan development, market research, and IP protection; and educational and networking activities and linkages to local ecosystem resources														
		Website: https://ncai.nhlbi.nih.gov/ncai/														
	REACH	Program goals: The REACHs accelerate the translation of scientific discovery into commercial products that improve health for patients.														

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		Program activities: REACHs are unique public-private partnerships featuring expertise and resources from the federal government, academia, and the private-sector that change the way discoveries with scientific and commercial potential are identified and developed. The program gives upstream consideration to commercial and business issues and uses industry-style project management with go/no-go milestones to develop de-risked technologies with well-designed business cases primed for licensing or startup company formation. The program enables the development of self-sustaining biomedical technology development ecosystems that encourage the conversion of laboratory discoveries into products and services and disseminates best practices for translating academic innovations into new drugs, devices, and diagnostics to other agencies, institutions, and regions across the nation.														
		Website: https://ncai.nhlbi.nih.gov/ncai/														
	NHLBI SBIR Phase IIB Bridge Award	Program goals: NHLBI SBIR Phase IIB Bridge Awards facilitate and accelerate the capital-intensive steps that are required to transition SBIR/STTR Phase II projects to the commercialization stage by promoting partnerships between SBIR/STTR Phase II awardees and third-party investors and/or strategic partners.															
		Program activities: The Bridge Award encourages business relationships between applicant small business concerns and third-party investors/strategic partners who can provide substantial financing to help accelerate the commercialization of promising new products and technologies that were initiated with SBIR/STTR funding. Applicants are expected to leverage their previous SBIR/STTR support in conjunction with the NHLBI Bridge Award funds to attract and negotiate third-party financing needed to advance a product or technology toward commercialization. The applicant's ability to secure independent third-party investor funds that equal or exceed the total amount of the NHLBI funds being requested over the entire Bridge Award project period helps validate the commercial potential that is essential for the projects solicited under the Bridge Award program.														
		Website: www.nhlbi.nih.gov/research/funding/sbir/funding-opportunities/targeted-funding/bridge-award														
	NHLBI SBIR Phase IIB Small Market Award	Program goals: The NHLBI SBIR Phase IIB Small Market Award provides support to Phase II SBIR or STTR awardees developing NHLBI mission-related technologies that address a rare disease or young pediatric populations.															

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: The Small Market Award encourages business relationships between applicants and third-party investors/strategic partners who can provide substantial financing to help accelerate the commercialization of promising new products and technologies that were initiated with SBIR/STTR funding. Applicants are expected to leverage their previous SBIR/STTR support, in conjunction with the NHLBI Small Market Award funds to attract and negotiate third-party financing needed to advance a technology toward commercialization. The applicant's ability to secure independent third-party investor funds that equal or exceed one-third of the NHLBI funds being requested over the entire project period helps validate the commercial potential that is essential for the projects solicited under this program. Projects supported by this award must require eventual Federal regulatory approval/clearance and be focused on commercializing biomedical technologies for rare diseases and/or young pediatric populations, and may address preclinical and/or clinical stages of technology development.														
		Website: www.nhlbi.nih.gov/research/funding/sbir/small-market-awards														
	NCI SBIR Phase IIB Bridge Award	Program goals: NCI SBIR Phase IIB Bridge Awards support the next stage of development for federally funded SBIR Phase II projects in the areas of cancer therapeutics, imaging technologies, interventional devices, diagnostics, and prognostics.														
		Program activities: This award addresses the "Valley of Death" funding gap between the end of the SBIR Phase II award and the subsequent round of financing needed to advance a product or service toward commercialization for projects in the technical/scientific areas of cancer therapeutics; cancer imaging technologies, interventional devices, and in vivo diagnostics; and/or in vitro and ex vivo cancer diagnostics and prognostics. To achieve this goal, the funding opportunity incentivized partnerships between federally-funded SBIR Phase II awardees and third-party investors and/or strategic partners. Preference is given to applications deemed likely to result in a commercial product, as indicated by the applicant's ability to secure substantial independent third-party investor funds. Applicants must provide a commercialization plan that describes the long-term commercialization strategy and details on any independent third-party investor funding that has already been secured or will be provided during the Bridge Award project period.														
		Website: https://sbir.cancer.gov/bridge														
	SBIR FRAC Workshop	Program goals: The SBIR FRAC Workshop provides awardees an opportunity to learn how to utilize federal and local resources in order to advance commercialization.														
		Program activities: The NCI SBIR Development Center FRAC Workshop is a two-day event open to current NCI SBIR/STTR awardees. The workshop brings together representatives from federal agencies including the FDA, CMS, and BARDA, as well as experts from local and private organizations to share their expertise with attending companies. Attendees also have a chance to engage in one-on-one meetings with their respective Program Directors, as well as with speakers at the event.														

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		Website: https://sbir.cancer.gov/node/277														
	Breast Cancer Startup Challenge	Program goals: The Breast Cancer Startup Challenge was a business plan and startup competition to accelerate the commercialization of inventions conceived and developed by NCI scientists and Avon Foundation grantees.														
		Program activities: The Breast Cancer Startup Challenge leveraged 10 research technologies that were judged to show great promise to advance breast cancer research. These inventions included therapeutics, diagnostics, prognostics, one device, one vaccine, one delivery system, and one health IT invention. Teams of business, legal, medical/scientific, engineering, computer science students and seasoned entrepreneurs evaluated these technologies to create business plans and start new companies to develop and commercialize them. Winners and finalists in the Breast Cancer Startup Challenge were not only recognized for creating a business plan and pitch, but were also invited to launch a startup, negotiate licensing agreements, and raise seed funding to further develop the inventions.														
		Website: http://www.breastcancerstartupchallenge.com/														
	Nanotechnology Startup Challenge in Cancer	Program goals: The Nanotechnology Startup Challenge in Cancer is a business plan and startup competition that leverages inventions available for licensing from NCI to accelerate the translation and development of nanotechnology solutions for the early detection, diagnosis, and treatment of cancer.														
		Program activities: CAI evaluated NCI's portfolio to identify those inventions with the strongest commercial viability. These inventions were eligible for use in the Nanotechnology Startup Challenge in Cancer. The Nanotechnology Startup Challenge in Cancer involves four phases. In Phase 0, teams outline their intent to participate in the Nanotechnology Startup Challenge in Cancer by providing information regarding the invention they will develop their business plan around, details and backgrounds of the members of their team, and how team members meet eligibility requirements. In Phase 1: Elevator Speech, teams develop a two-minute elevator speech via recorded video; a 350-word executive summary outlining potential commercial product(s); and a company vision. Winners of Phase 1 move on to Phase 2: Business Plan, in which the teams develop a 10-page business plan with a detailed financial plan and present a 20 minute "live" pitch to the challenge judges. Winners of this phase receive a $2000 award as well as move on to Phase 3: Startup. In Phase 3, teams launch their startups, including incorporation, applying for licenses, and executing other regulatory/developmental needs.														
		Website: http://www.nscsquared.org/														

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	Invention Development Program	Program goals: The Invention Development Program accelerates the development of selected technologies through the early stages of validation to inform critical decision points in the patenting process.														
		Program activities: The Invention Development Program accelerates development of NCI's inventions by providing funding for studies conducted by Leidos Biomedical Research to demonstrate proof-of-principle. NCI identified 21 inventions from its portfolio that were in need of specific data to attract commercial interest. The inventions were evaluated based on uniqueness, patent status, public health benefit, stage of research, patent filing date, and cost. A review committee composed of NCI scientists with experience in drug development and preclinical validation reviewed the 21 inventions and selected eight inventions as top candidates for the program. The eight technologies that moved forward in the pilot program are in various phases of in vivo studies. Five inventions in the program have yielded actionable data so far.														
		Website: NA														
	TRND	Program goals: The TRND program supports pre-clinical development of therapeutic candidates intended to treat rare or neglected disorders, with the goal of enabling an Investigational New Drug (IND) application to the Food and Drug Administration (FDA).														
		Program activities: The TRND program encourages and speeds the development of new treatments for diseases with high unmet medical needs. The program advances the entire field of therapeutic development by encouraging scientific and technological innovations to improve success rates in the crucial pre-clinical stage of development. TRND stimulates therapeutic development research collaborations among NIH and academic scientists, nonprofit organizations, and pharmaceutical and biotechnology companies working on rare and neglected illnesses. The program provides NIH's rare and neglected disease drug development capabilities, expertise, clinical resources, and regulatory expertise to research partners to optimize promising therapeutics and move them through pre-clinical testing, with the goal to generate sufficient-quality data to support successful IND applications and first-in-human studies in limited circumstances.														
		Website: https://ncats.nih.gov/trnd														
	BrIDGs	Program goals: The BrIDGs program enables research collaborations to advance candidate therapeutics for both common and rare diseases through late-stage pre-clinical development toward an IND application and clinical testing.														

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		Program activities: Investigators do not receive grant funds through this program. Instead, selected researchers partner with NCATS experts to generate pre-clinical data and clinical-grade material through government contracts for use in IND applications to a regulatory authority such as the FDA. BrIDGs provides synthesis, formulation, pharmacokinetic and toxicology expertise and resources to its collaborators.														
		Website: https://ncats.nih.gov/bridgs														
	iFund	Program goals: The iFund supports the design and development of innovations that show promise for making a substantial impact on public health and how the CDC accomplishes its mission.														
		Program activities: The iFund seeks to promote the inventiveness and creativity of the CDC community in the design and development of new innovations which show promise for making a substantial impact on public health and how we accomplish our mission. The iFund provides intramural funding and support to CDC staff to develop initial proof of concept "prototypes" and pilot projects, or scale up more mature projects that have been proven effective through pilot or replication studies.														
		Website: https://www.cdc.gov/od/science/technology/innovation/innovationfund.htm														
	I-Catalyst	Program goals: I-Catalyst program trains CDC scientists to transform ideas into solutions.														
		Program activities: I-Catalyst is an internal innovation training program intended to help CDC teams transform ideas into solutions. I-Catalyst is designed to help teams get their ideas out of the starting blocks and down the track through a discovery, ideation, and prototyping process. I-Catalyst is based on the NSF's successful I-Corps program.														
		Website: NA														
Department of Homeland Security																

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Science and Technology Directorate (S&T)	Office of Research and Development Partnerships (RDP)	Support Anti-Terrorism by Fostering Effective Technologies Act (SAFETY Act)													X	
		Technology Scouting and Horizon Scanning		X	X											
		Centers of Excellence (COEs)	X		X	X	X									
	Homeland Security Advanced Research Projects Agency (HSARPA)	HSARPA	X		X	X										
		Transition to Practice Program (TPP)	X						X			X	X	X		
		Homeland Security Innovation Program (HSIP)	X		X	X			X		X	X				
		Silicon Valley Office (SVO)	X		X	X					X					

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	Support to the Homeland Security Enterprise and First Responders Group (FRG)	EMERGE Accelerator			X					X		X				
Program descriptions	SAFETY Act	Program goals: The SAFETY Act aims to designate anti-terrorism technologies that qualify for protection under the system of risk management. The program incentivizes the private sector to commit additional resources to significantly improve anti-terrorism preparedness and resiliency by reducing private sector risk and liability for developing anti-terrorism technologies.														
		Program activities: This program provides liability protections for claims resulting from an act of terrorism and provides legal liability protection for providers of qualified anti-terrorism technologies. The SAFETY Act provides two levels of liability protections: (1) designation, where the seller's liability for products or services is limited to the amount of liability insurance that the Department of Homeland Security (DHS) determines the seller must maintain; and (2) certification, which allows a seller of anti-terrorism technology to assert the Government Contractor Defense for claims arising from acts of terrorism.														
		Website: https://www.safetyact.gov/pages/homepages/Home.do														
	Technology Scouting and Horizon Scanning	Program goals: Technology Scouting aims to provide DHS S&T with a foundation for program decisions and help shape program priorities. Technology scouting shapes the way DHS S&T discovers, monitors, and assesses new and emerging technologies critical to homeland security. The program goals are to improve the availability of technology alternatives, increase the speed of project execution, and reduce costs for projects.														
		Program activities: The technology scouting program provides program managers with a better understanding of the state of technology, including new and emerging technology, market analysis, and private sector innovation landscapes. The program does this in two ways: (1) technology scouting, which maps patent landscapes, finds federal laboratory technology, analyzes venture capital firms, and looks across relevant markets for a technology that will meet S&T needs; and (2) horizon scanning, which maintains constant awareness of the technology space to inform project managers of impactful breakthroughs or alternatives.														
		Website: https://www.dhs.gov/publication/technology-scouting-and-horizon-scanning														

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	COEs	Program goals: COEs establish a coordinated, university-based system to enhance the nation's homeland security.														
		Program activities: COEs develop multidisciplinary, customer-driven, innovative tools and technologies to solve real-world homeland security challenges and help train the next generation of homeland security experts. The COEs assist the homeland security community with specialized research, expertise, and facilities. Each COE focuses on a specific set of DHS-relevant challenges and addresses these challenges with multidisciplinary, customer-driven research and technology development. The COEs also provide their knowledge and technology to assist in rapid response and emergency operations.														
		Website: https://www.dhs.gov/science-and-technology/centers-excellence														
	HSARPA	Program goals: HSARPA awards competitive, merit-reviewed grants, cooperative agreements, or contracts to public or private entities, including businesses, federally funded research and development centers, and universities that support basic and applied homeland security research that promotes revolutionary changes in technologies.														
		Program activities: HSARPA conducts analysis to understand current missions, systems and processes and helps identify operational gaps where new technologies can have the most impact. HSARPA develops, tests and evaluates these new homeland security technologies and capabilities. HSARPA delivers usable, scalable, cost-effective, mission-focused capabilities to DHS components and other homeland security enterprise partners. The team also advises partners on science, technology, and industry developments with respect to mission, threats, and opportunities.														
		Website: https://www.dhs.gov/science-and-technology/hsarpa														
	TPP	Program goals: TPP aims to (1) identify mature technologies that address an existing or imminent cybersecurity gap in public or private systems that impacts national security; (2) increase use through partnerships, product development efforts, and marketing strategies; and (3) improve the long-term ability for federal government research labs to transition technology more efficiently.														
		Program activities: TTP conducts tech foraging to identify promising cybersecurity technologies from several sources of federally funded R&D. Approximately eight new technologies are selected by TTP every year. The TTP transition process includes training, market validation, testing and evaluation, pilot deployment, and outreach. Technologies are introduced to potential partners, investors, and integrators, and showcased at a national series of Technology Demonstration Days. TTP supports multiple paths to transition, including open source, licensing, startups, adoption by cyber operators, and government use.														

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		Website: https://www.dhs.gov/science-and-technology/csd-ttp														
	HSIP	Program goals: HSIP generates innovation in hubs around the nation and the world to solve DHS's most difficult challenges. The program aims to use existing procurement authorities to mirror the process and pace of Silicon Valley and other innovative investment communities.														
		Program activities: HSIP uses Innovation Other Transaction Solicitations (OTSs) to work with non-traditional performers. These Innovation OTSs are open to all innovation ecosystems and offer up to $800k in funding over 24 months. The Innovation OTS program offers several advantages to performers, including the government as an early adopter, no dilution of ownership, and pilots and operator feedback. The HSIP regional programs help companies better understand DHS, S&T, DHS components, the homeland security mission, and how innovation corridors can help the government solve problems across the Homeland Security Enterprise.														
		Website: https://www.dhs.gov/science-and-technology/hsip														
	SVO	Program gals: The DHS SVO cultivates a pipeline for non-traditional partners who have typically never done business with the government to develop solutions for the toughest homeland security challenges.														
		Program activities: The SVO helps DHS keep pace with the innovation community in order to tackle the hardest problems faced by the DHS. SVO cultivates relationships with technology companies from small startups to larger firms, incubators and accelerators, to help them better understand DHS's operational mission. SVO also co-invests in promising technologies to accelerate transition to market, demonstrate, and pilot near-term technologies that could better protect the homeland, fund new research and development using forward-leaning acquisition methods (such as accelerators and prize competitions), and transition emerging innovative technology into DHS programs and the Homeland Security Enterprise.														
		Website: https://www.dhs.gov/publication/silicon-valley-office														
	EMERGE Accelerator	Program goals: EMERGE is a pilot for entrepreneurs designed to accelerate the development of technologies that address the unique needs of first responders by providing early market validation, test and evaluation opportunities, and paths to introduce those technologies to a variety of markets, including partners in the public sector.														

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		Program activities: EMERGE participants are provided with business development education and connected with mentors to produce next generation innovative wearable technology. The EMERGE Accelerator program works with the Center for Innovation Technology and business accelerators TechNexus and Tech Wildcatters, to educate the investment, entrepreneurial, and startup communities on these specific homeland security needs. In 2015, the program selected around twenty startups and second-stage companies from roughly a hundred candidates. In 2016, the program selected 10 startups from over 260 candidates and worked with over 200 accelerators, incubators, and university partners across 149 cities.														
		Website: https://www.dhs.gov/publication/emerge-accelerator-program														
Department of Transportation																
Federal Highway Administration (FHWA)	Office of Innovative Program Delivery	State Transportation Innovation Council (STIC) Incentive Program		X	X	X					X					
		Every Day Counts (EDC) Program		X	X						X			X		
		Accelerated Innovation Deployment (AID) Demonstration Program		X	X											X
Program descriptions	STIC Incentive Program	Program goals: The STIC Incentive Program offers technical assistance and resources to support the standardization of innovative practices among state transportation agencies and other public sector stakeholders.														

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		Program activities: The STIC Incentive Program provides up to $100,000 per State per Federal fiscal year to STICs to support or offset the costs of standardizing innovative practices in a State transportation agency (STA) or other public sector STIC stakeholder. STIC Incentive Program funding may be used to conduct internal assessments; build capacity; develop guidance, standards, and specifications; implement system process changes; organize peer exchanges; offset implementation costs; or conduct other activities the STIC identifies to address Technology and Innovation Deployment Program (TIDP) goals.														
		Website: https://www.fhwa.dot.gov/innovation/stic/														
	EDC Program	Program goals: The EDC Program is a state-based model for the identification and rapid deployment of proven but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion, and improve environmental sustainability.														
		Program activities: Every two years FHWA works with state and local transportation agencies and industry stakeholders to select a new collection of innovations to champion based on market readiness, impacts, benefits, and ease of adoption. Transportation leaders from across the country gather at regional summits to discuss the EDC technologies for deployment, identify the innovations that make the most sense for their unique program needs, establish performance goals, and commit to finding opportunities to get those innovations into practice over the next two years. Throughout the two-year deployment cycle, specifications, best practices, lessons learned, and relevant data are shared among stakeholders through case studies, webinars, and demonstration projects.														
		Website: https://www.fhwa.dot.gov/innovation/everydaycounts/														
	AID Demonstration Program	Program goals: The AID Demonstration program provides incentive funding for eligible entities to accelerate the implementation and adoption of innovations in highway transportation.														
		Program activities: The AID Demonstration program provides funding to state departments of transportation (DOTs), federal land management agencies, and tribal governments that covers the cost of implementation and adoption of an innovation being deployed in a highway transportation project. AID Demonstration projects may involve any phase of a highway transportation project between project planning and project delivery including planning, financing, operation, structures, materials, pavements, environment, and construction and must include an innovation proven as a real-world highway transportation application but not routinely used by the applicant.														
		Website: https://www.fhwa.dot.gov/innovation/grants/														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
Environmental Protection Agency																
Agency Wide		Environmental Technology Innovation Clusters	X	X							X					
Office of Water		WaterSense	X					X								
Office of Air and Radiation		SmartWay	X					X			X		X			
		ENERGY STAR®	X					X								
		Continuous Emissions Monitoring Performance Specifications	X					X								
Office of Research and Development		Roadmap for Next Generation Air Monitoring	X	X	X		X		X		X					
Program descriptions	Environmental Technology Innovation Clusters	Program goals: The Environmental Protection Agency's (EPA) Environmental Technology Innovation Clusters program supports community-based business clusters that seek to solve water problems and create jobs at the same time through the development and deployment of innovative water technologies.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: Environmental Technology Innovation Clusters are regional groupings of businesses, government, research institutions, and other organizations focused on innovative technologies for clean water. The program serves cluster organizations in an advisory role by disseminating best practices in cluster development, communicating EPA environmental priorities such as the Blueprint for Integrating Technology Innovation into the National Water Program, and convening cluster organization leaders. The program maintains a national inventory of water technology SBIR awards across eight agencies. The U.S. Small Business Administration and the U.S. Department of Commerce are full partners in this effort.														
		Website: https://www.epa.gov/clusters-program														
	WaterSense	Program goals: WaterSense aims to transform the marketplace for products and services that use water, and promote a nationwide ethic of water efficiency to conserve water resources for future generations and reduce water and wastewater infrastructure costs. The program encourages water efficiency in the United States through the use of a special label on consumer products.														
		Program activities: The EPA provides and maintains the WaterSense brand and develops national specifications for water-efficient products and programs through agreement and partnerships with interested stakeholders, such as product manufacturers, retailers, and water utilities. EPA requires all products bearing the WaterSense label to be assessed for conformance to the relevant WaterSense product specification by an accredited third-party product certifying body. Accredited product certifying bodies are licensed by EPA to certify that products conform to applicable specifications and to authorize the use of the WaterSense label in conjunction with the certified product.														
		Website: https://www.epa.gov/watersense														
	SmartWay	Program goals: SmartWay is a partnership with the private sector to achieve better environmental outcomes, save money, and drive technical innovation through improved efficiency in moving goods across commercial supply chains.														
		Program activities: SmartWay helps U.S. businesses (freight shippers, carriers, logistics companies) innovate and lean their goods movement with tools, methods and technical advice that businesses rely upon to measure, benchmark and improve efficiency across freight supply chains. SmartWay technology verification and branding works with manufacturers and suppliers to accelerate the availability, adoption and market penetration of cleaner, fuel-saving technologies and operational practices. SmartWay also advances technical capacity for U.S. companies with overseas supply chains, by working to harmonize global sustainability accounting methods. More than 3,600 companies and over 400 trade associations and other organizations participate in SmartWay, along with dozens of manufacturers and suppliers.														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Website: https://www.epa.gov/smartway														
	ENERGY STAR®	Program goals: ENERGY STAR® is the government-backed symbol for energy efficiency, providing simple, credible, and unbiased information that consumers and businesses rely on to make well-informed decisions. It is a voluntary program that aims to identify and promote energy-efficient products and buildings in order to reduce energy consumption, improve energy security, and reduce emissions through voluntary labeling or other forms of communication about products and buildings that meet the highest energy efficiency standards.														
		Program activities: ENERGY STAR boosts the adoption of energy efficient products, practices, and services through valuable partnerships, objective measurement tools, and consumer education. For products, ENERGY STAR ensures that each product that earns the label is independently certified to deliver the quality, performance, and savings that consumers have come to expect. ENERGY STAR has also developed energy performance rating systems for several commercial and institutional building types and manufacturing facilities, which provide a means for benchmarking the energy efficiency of specific buildings and industrial plants against the energy performance of similar facilities. For buildings and plants, ENERGY STAR tools and resources help businesses determine cost-effective approaches to managing energy use in their buildings and plants—enabling the private sector to save energy, increase profits, and strengthen their competitiveness. The program includes an online tool, ENERGY STAR Portfolio Manager®, that calculates an ENERGY STAR score for commercial buildings, which has become the industry standard for rating a facility's energy performance.														
		Website: https://www.energystar.gov/														
	Continuous Emissions Monitoring Performance Specifications	Program goals: These specifications set continuous emissions monitoring performance specifications and quality assurance procedures for governing the installation, performance, and continued operation of continuous emissions monitoring systems (CEMS) used to determine continuous compliance with air emissions standards for stationary sources of air pollution. These CEMS performance specifications and quality assurance procedures are designed to be as performance-based as possible to allow for the introduction of new and innovative monitoring technologies into the marketplace.														

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		Program activities: EPA's CEMS Performance Specifications and QA Procedures currently address: (1) Clean Air Act criteria pollutants including particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and total volatile organic compounds, (2) hazardous air pollutants (HAP) including mercury, hydrogen chloride, hydrogen sulfide, and speciated gaseous HAP organics, and (3) the diluent gases. Future projects will aim to refine performance specifications for Fourier-Transform Infrared technology for monitoring of multiple HAP simultaneously and expand the current gaseous hydrogen chloride (HCl) performance specifications to cover additional inorganic gases.													
		Website: https://www.epa.gov/emc/performance-specifications-and-other-monitoring-information														
	Roadmap for Next Generation Air Monitoring	Program goals: The Roadmap for Next Generation Air Monitoring summarizes major findings about the Next Generation of Air Monitoring (NGAM), particularly sensor technology. It focuses on three near-term goals: (1) promoting the development of affordable, near source, fenceline monitoring technologies and sensor network-based leak detection systems; (2) supplementing air quality monitoring networks through development of low cost, reliable air quality monitoring technology; and (3) supporting environmental justice communities and citizen science efforts to measure air pollution in local areas.														
		Program activities: The Roadmap proposes research and other activities in each of these three areas: (1) Technology Development, Testing, and Integration; (2) Technology Demonstration, Outreach and Communication Strategies; and (3) IT infrastructure and New Data Streams.														
		Website: https://www.epa.gov/sites/production/files/2014-09/documents/roadmap-20130308.pdf														
National Aeronautics and Space Administration																
Private Business - From Multi Federal Agency Initiative, including the National Aeronautics and Space Administration (NASA)		LAUNCH	X				X				X	X				
NASA-Initiated Public/Private Partnership		Space Race		X					X	X		X		X		X

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
Human Exploration and Operations Mission Directorate	Advanced Exploration Systems Division	Next Space Technologies for Exploration Partnerships (NextSTEP)	X		X	X					X					
Space Technology Mission Directorate	Technology Demonstration Missions	X	X	X												
	Flight Opportunities	X	X	X												
	Centennial Challenges	X	X	X											X	
	Regional Economic Development (RED)	X	X	X						X			X			
	Technology Transfer Program	QuickLaunch							X							
		Startup NASA	X	X					X							X
		NASA Software Catalog		X					X							

Agency	Office	Program	Science and technology development							Enterprise development						
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		Technology Transfer University (T2U)								X				X		
Program descriptions	LAUNCH	Program goals: LAUNCH aims to build and nurture a community of innovators, thought leaders and decision makers across value chains to collectively understand, articulate, and scale solutions for positive systems change leading to a more sustainable society.														
		Program activities: LAUNCH is a network-centered innovation platform that convenes and curates networks of individuals and organizations. LAUNCH coordinates system-wide collaborations to address complex challenges through its curated network of innovators and thought leaders. LAUNCH Network members help shape LAUNCH's challenge statements, recruit and select innovators, provide pro-bono innovator support and mentorship, and join a coalition of the committed to actively shepherd change.														
		Website: http://www.launch.org/														
	Space Race	Program goals: Space Race fostered new startup companies and encouraged adoption of NASA technologies, by teaming with CAI to run a multi-phase business plan competition in 2016. The competition leveraged NASA's new prgoram – "Startup NASA" – to create space technology spin-offs.														
		Program activities: CAI reviewed NASA's portfolio of technologies and identified those that have near-term commercialization potential. CAI held a challenge for teams to explore the market potential of the technologies and write business plans. The winners of the competition were awarded a cash prize, provided by third-party venture capital investors, and encouraged to incorporate and pursue licensing the technologies from NASA, using their winnings as seed funding for the new business. The challenge was supported by a startup accelerator designed to provide training and expert mentorship to all participants.														
		Website: https://www.space-race.org/														
	NextSTEP	Program goals: The NextSTEP program is a public-private partnership model that encourages commercial development of deep space exploration capabilities to support more extensive human spaceflight missions in the Proving Ground around and beyond cislunar space—the space near Earth that extends just beyond the moon.														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: NextSTEP stimulates the commercial space industry to help NASA achieve its strategic goals and objectives for expanding the frontiers of knowledge, capability, and opportunities in space. The NextSTEP partnership model provides an opportunity for NASA and industry to partner to develop capabilities that meet NASA human space exploration objectives while also supporting industry commercialization plans. Through these public-private partnerships, NextSTEP partners provide advance concept studies and technology development projects in the areas of advanced propulsion, habitation systems, and small satellites.														
		Website: https://www.nasa.gov/nextstep														
	Technology Demonstration Missions	Program goals: Technology Demonstration Missions seek to mature crosscutting, laboratory-proven technologies—ones that could radically advance NASA's mission in space and reap untold benefits for science and industry here on Earth—to flight-ready status.														
		Program activities: The Technology Demonstration Mission program focuses on crosscutting technologies with strong customer interest that meet the needs of NASA and industry by enabling new missions or greatly enhancing existing ones. Chosen technologies are thoroughly ground- and flight-tested in relevant operating environments—reducing risks to future flight missions, gaining operational heritage and continuing NASA's long history as a technological leader.														
		Website: https://www.nasa.gov/mission_pages/tdm/main/index.html														
	Flight Opportunities	Program goals: The Flight Opportunities program advances innovative space technologies of interest to NASA while also stimulating the growth and use of the U.S. commercial spaceflight industry as well as supporting capability development in the suborbital and orbital small satellite launch vehicle market.														
		Program activities: The program provides access to space-relevant environments through the use of commercial reusable suborbital launch vehicles, rocket-powered vertical takeoff, vertical landing platforms, high-altitude balloons and parabolic aircraft flights. The program entails two activities. Through Suborbital Flight Testing and Capability Development, NASA selects promising technologies from industry, academia and government, and tests them on commercial suborbital platforms. This approach takes technologies from a laboratory environment and gives them flight heritage, increasing their Technology Readiness Level (TRL), while also nurturing the development of U.S. commercial spaceflight capabilities, services, and skills. Through Small Launch Vehicle Technology Development, NASA uses public-private partnerships to accelerate the development of commercial capabilities that enable the frequent launch of small satellites to low Earth orbit (LEO) at a cost per kilogram of payload much lower than currently available.														
		Website: https://www.nasa.gov/directorates/spacetech/flightopportunities/index.html														

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	Centennial Challenges	Program goals: Centennial Challenges directly engage the public in the process of advanced technology development by offering incentive prizes to generate revolutionary solutions to problems of interest to NASA and the nation.														
		Program activities: The program seeks innovations from diverse and non-traditional sources. Competitors are not supported by government funding and awards are only made to successful teams when the challenges are met. The Centennial Challenge prizes are offered to independent inventors including small businesses, student groups, and individuals. These independent inventors are sought to generate innovative solutions for technical problems of interest to NASA and the nation and to provide them with the opportunity to stimulate or create new business ventures.														
		Website: https://www.nasa.gov/directorates/spacetech/centennial_challenges/index.html														
	RED	Program goals: The RED program creates, contributes to, catalyzes, and supports economic and innovative ecosystems across the country through strategic regional partnerships with external public and private sector organizations in business sectors of critical importance to the region of interest.														
		Program activities: The RED process is different in every region, but follows four general steps in order to be successful. In Step One: "Asset Inventory," an inventory of the regional and federal assets is conducted. In Step Two: "Market Analysis and Vision Gathering," an industry and market analysis is conducted to understand what opportunities both provide. In Step Three: "Demonstration Projects," the regional players are brought together to determine common goals and alignment between industry and NASA, as well as what assets can be utilized and how they are linked. Demonstration projects include technology showcases, technology interchange forums, technology roadshows, technology docking, and NASA Executive-in-Residence programs. In Step Four: "Ecosystem Sustainability," the motivation is expected to come from the ecosystem and its customers.														
		Website: https://www.nasa.gov/directorates/spacetech/regional_economic_development														
	QuickLaunch	Program goals: QuickLaunch allows NASA to quickly turn license applications into license agreements and transfer technologies to the licensee.														
		Program activities: NASA offers a specially selected portfolio of technologies available for commercial nonexclusive licensing. QuickLaunch licenses have a set initial fee, annual royalty, and standard terms. For many technologies, licensees may request an evaluation license for a short term prior to requesting a commercial license.														
		Website: https://quicklaunch.nasa.gov/about.php														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
	Startup NASA	Program goals: Startup NASA offers licenses with no up-front costs for commercial use of NASA's patented technologies.														
		Program activities: Startup NASA licenses waives initial licensing fees and require no minimum fees for the first three years. Once a company starts selling a product, NASA collects a standard net royalty fee. This allows companies to hold onto their cash while securing the intellectual property needed to carve out competitive market space. Startup NASA licenses are only available for U.S. companies formed with the express intent of commercializing the licensed NASA technology. The startup agreement applies only to non-exclusive licenses, which means other companies may apply for similar rights to use the technology for commercial purposes. Companies entering into these licenses must develop a commercialization plan and report on efforts to achieve practical application. Startup NASA qualifying technologies have been vetted for technical and commercial viability by NASA and external sources. In addition, licensees have access to NASA technical personnel and facilities for additional support.														
		Website: https://technology.nasa.gov/startup														
	NASA Software Catalog	Program goals: The NASA Software Catalog offers an extensive portfolio of software products for a wide variety of technical applications, all free of charge to the public, without any royalty or copyright fees.														
		Program activities: The catalog has contributions from all of NASA's centers on data processing/storage, business systems, operations, propulsion, and aeronautics. It includes many of the tools NASA uses to explore space and broaden our understanding of the universe. Each catalog entry is accompanied with a plain language description of what it does. The NASA Software Catalog was the first comprehensive listing of publicly available software to be compiled by a federal government agency -- the largest creator of custom code. While access restrictions apply to some codes, NASA has automated and updated its software release process to ensure that it is as quick, easy, and straightforward as possible.														
		Website: https://software.nasa.gov/														
	T2U	Program goals: T2U brings real-world, NASA-proven technologies into the classroom so that business students can practice creating market assessments and business plans for high-tech patents.														

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		Program activities: In this program, business students have access to the NASA scientists and innovators, giving them a unique look into the fine-grained details of the technology they are working on. Through the T2U program, NASA field centers across the country engage business schools and hundreds of students each year. T2U educates young entrepreneurs about the benefits of using federal government research and development assets in commercial applications.														
		Website: https://technology.nasa.gov/t2u														
National Science Foundation																
Directorate for Engineering	Division of Industrial Innovation and Partnerships (IIP)	Innovation Corps Program (I-Corps™)								X	X	X		X		
		Industry-University Cooperative Research Centers Program (IUCRC)	X				X				X					
		Partnerships for Innovation: Building Innovation Capacity (PFI:BIC)	X			X					X					

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			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Partnerships for Innovation: Accelerating Innovation Research-Technology Translation (PFI:AIR-TT)	X			X				X				X		
		Grant Opportunities for Academic Liaison with Industry (GOALI)	X			X	X				X					
	Division of Engineering Education and Centers (EEC)	Engineering Research Centers (ERC)	X				X		X		X					
Program descriptions	I-Corps™	Program goals: The I-Corps Program aims to foster entrepreneurship that will lead to the commercialization of technology that has been supported previously by NSF-funded research. The program provides entrepreneurial education for federally-funded scientists and engineers, pairing them with business mentors for an intensive curriculum focused on discovering a demand-driven path from their lab work to a marketable product.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Program activities: There are three distinct components of I-Corps: Teams, Nodes, and Sites. I-Corps Teams include NSF-funded researchers who will receive additional support—in the form of mentoring and funding—to accelerate innovation that can attract subsequent third-party funding. Nodes serve as hubs for education, infrastructure, and research that engage academic scientists and engineers in innovation; they also deliver the I-Corps Curriculum to I-Corps Teams. I-Corps Sites are academic institutions that catalyze the engagement of multiple, local teams in technology transition and strengthen local innovation.														
		Website: https://www.nsf.gov/news/special_reports/i-corps/														
	IUCRC	Program goals: The IUCRC program enables industrially-relevant, pre-competitive research via multi-member, sustained partnerships among industry, academe, and government. The NSF invests in these partnerships to promote research programs of mutual interest to industry members and Center faculty, to contribute to the nation's research infrastructure base, to enhance the intellectual capacity of the engineering or science workforce through the integration of research and education, and to facilitate technology transfer.														
		Program activities: The IUCRC program seeks to achieve its goals by: (1) contributing to the nation's research enterprise by developing long-term partnerships among industry, academia, and government; (2) leveraging NSF funds with industry to support graduate students performing industrially-relevant pre-competitive research; (3) expanding the innovation capacity of our nation's competitive workforce through partnerships between industries and universities; and (4) encouraging the nation's research enterprise to remain competitive through active engagement with academic and industrial leaders throughout the world.														
		Website: https://www.nsf.gov/eng/iip/iucrc/home.jsp														
	PFI:BIC	Program goals: PFI:BIC supports interdisciplinary academic-industry partnerships that carry out research to advance, adapt, and integrate technology(ies) into specified, human-centered smart service systems with the potential to achieve transformational change in an existing service system or to spur an entirely new service system. These partnerships are led by an interdisciplinary academic research team with at least one industry partner. The PFI:BIC program places a heavy emphasis on the quality, composition, and participation of the partners, including their appropriate contributions.														
		Program activities: PFI:BIC funds research partnerships working on projects that operate in the post-fundamental/translational space that require additional effort to integrate the technology into a real service system, one that can identify, learn, adapt, and make decisions. The research tasks in turn can spawn additional discoveries inspired by this interaction of humans with the technology. The research components included in these projects are engineered system design and integration; computing, sensing, and information technologies; and human factors, behavioral sciences, and cognitive engineering.														

Agency	Office	Program	Science and technology development							Enterprise development						
			Tech. devt.	Tech. scouting	Govt. need	Financial support	Talent devt.	Standard setting	IP mgmt./ tech. transfer	Business training	Business networks	Business mentors and peers	Business services	Talent devt.	Liability protn.	Financial support
		Website: https://www.nsf.gov/eng/iip/pfi/bic.jsp														
	PFI:AIR-TT	Program goals: The PFI:AIR-TT program supports research to overcome technology barriers or knowledge gaps in the transformation of fundamental science and engineering discoveries into market-valued solutions.														
		Program activities: PFI:AIR-TT enables the translation of research discoveries along a path toward commercial reality while engaging faculty and students in entrepreneurial and market-oriented thinking, leveraging prior NSF investments, and providing NSF-funded research alliances the opportunity to develop academic-based innovation ecosystems. Researchers are expected to develop a proof of concept, prototype, or scale-up of the prototype that addresses real-world constraints and provides a competitive value in a potential application space. During the course of the AIR-TT award, it is also expected that the team will advance their understanding of business as it relates to their technology, and that students are engaged to learn about innovation and technology translation.														
		Website: https://www.nsf.gov/eng/iip/pfi/air-tt.jsp														
	GOALI	Program goals: GOALI promotes university-industry collaboration by making project funds or fellowships/traineeships available to support an eclectic mix of industry-university linkages across the Foundation. By increasing the number of industrial partnerships and collaborations, NSF aims to improve the nation's capacity for intellectual and economic growth. By serving as a catalyst for industry-university partnerships, NSF helps ensure that intellectual capital and emerging technologies are brought together in ways that promote economic growth and an improved quality of life.														
		Program activities: Academic scientists and engineers can request GOALI funding either in conjunction with a regular proposal submitted to a standing NSF program or as a supplemental funding request to an existing NSF-funded award. NSF funding can be used for university research/education activities and may support activities of faculty and their students and research associates in the industrial setting. NSF funds are not permitted to be used to support the industrial research partner. GOALI projects focus on research that addresses shared interests by academic researchers and industrial partners. The research furthers scientific and engineering foundations to enable future breakthrough technologies with the potential to address critical industry needs.														
		Website: https://www.nsf.gov/eng/iip/goali.jsp														

Agency	Office	Program	Science and technology development							Enterprise development						
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	ERC	Program goals: ERCs support basic and translational research on national priorities such as water, clean energy, biotechnology and healthcare, advanced manufacturing, and critical civil infrastructure. The program aims to integrate engineering research and education with technological innovation to transform national prosperity, health, and security. ERCs create an innovative, inclusive culture in engineering to cultivate new ideas and pursue engineering discovery that achieves a significant science, technology, and societal outcome within the 10-year timeframe of NSF support.														
		Program activities: The ERC program has three key elements: (1) cross-disciplinary and systems-oriented research; (2) education and outreach; and (3) industrial collaboration and technology transfer. Each ERC is established as a three-way partnership involving academe, industry, and NSF (in some cases with the participation of state, local, and/or other federal government agencies). Total annual funding for each Center ranges from $3.1 to $19.4 million, with NSF's contribution ranging from $1.8 to $4 million per year, averaging $3 million per year.														
		Website: http://erc-assoc.org/														

Govt. need = government need; IP mgmt./ tech. transfer = intellectual property management/ technology transfer; Liability protn. = liability protection; NA = not available; Talent devt. = talent development; Tech. devt. = technology development; Tech. scouting = technology scouting.

Note(s)

The table summarizes policy and program information collected during the spring and fall of 2017 from federal staff for a selected set of U.S. agencies with major R&D and technology development activities. The table reflects agency responses and is not intended to be exhaustive.

Source(s)

National Science Foundation, National Center for Science and Engineering Statistics; SRI International, special tabulations of federal program information (2017).

Science and Engineering Indicators 2018