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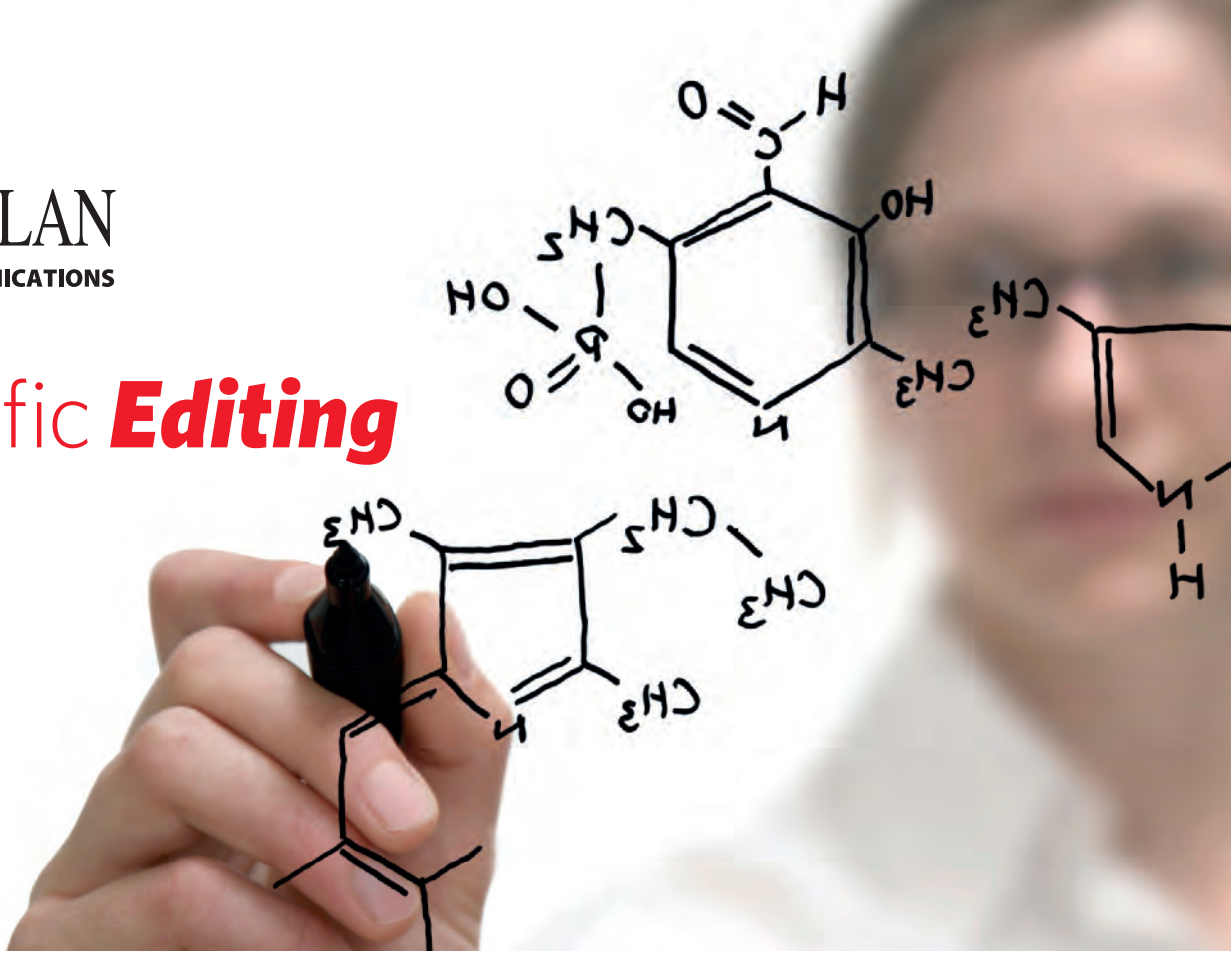

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INTRODUCTION

Nature Publishing Group is delighted to present the 2011 ranking of research institutions and countries in the Asia-Pacific region based on the Nature Publishing Index, a measure of the output of research articles in Nature journals. Simultaneous with this publication we are releasing an updated global version of the index as a beta website with a ranking of the world's top 100 institutions to place the Asia-Pacific results in a global context.

The Asia-Pacific index has now been in existence for three years, enabling us to present data for 2009, 2010 and 2009–2011 combined as well as results for 2011 alone. The global output of papers in Nature journals has risen from nearly 2,600 in 2009 to over 3,300 in 2011, largely due to the advent of the new publications *Nature Communications* (in April 2010) and *Nature Climate Change* (April 2011). In 2011, 26% of papers in Nature primary research journals had at least one author from the Asia-Pacific, up from 22% in 2010 and 20% in 2009. When article counts are corrected for the percentage of authors from the Asia-Pacific in each article, the rise in output was from 11% to 14%.

Nature Communications, a new online-only journal covering all of the natural sciences and offering the option to authors of open access publishing, has proved particularly popular in the Asia-Pacific with 41% of papers having at least one Asia-Pacific author up from 36% in the journal's launch year. *Nature Communications*, which published 451 papers in 2011, is thus a major driving force behind the continuing dramatic growth in output from the Asia-Pacific.

The index is just one of many ways to assess the output of institutions and countries. The index offers a unique insight into some of the highest-quality basic research emerging from the rapidly developing Asia-Pacific region. This supplement provides snapshots for 2009, 2010 and 2011. To see the latest results from the region, please visit the index website at **www.natureasia.com/publishing-index** which is updated every week with a moving window of 12 months of data.

On the index website, users can drill down to find the abstracts of papers that make up the index, allowing for deep analysis of some of the best research in the region across a broad range of fields. There is also historical data and graphs extending back to 2000 that show the dramatic rise in output of high quality research from the region country by country.

However, there are several caveats that must be applied in interpreting the index. Nature journals, although covering a broad spectrum of basic research in the life sciences, physical, chemical and geosciences, provide relatively limited coverage of applied sciences, engineering and clinical medicine. The index should therefore be viewed primarily as an index of high quality basic and not applied research. There are, however, exceptions, such as the journal *Nature Photonics*, based in Tokyo, which covers both domains.

The output of an institution or country obviously depends on its size. Within the index there are large institutions such as the Chinese Academy of Sciences and the Max Planck Institutes that have very large numbers of institutes and researchers, and a small country like Singapore with a population of only 5.1 million does remarkably well to come in the same league as giants like Japan and China, which have populations of a magnitude much larger than the little island nation. We provide some statistical data on each of the top five countries so this factor of size can be taken into account.

Lastly, the rise in number of Nature journals each year has to be borne in mind in interpreting the index. Looking at the percentage output of papers by country and institution is one way to address this issue and this approach is adopted in some instances in this year's supplement.

With these caveats, we believe the index provides an extremely powerful tool to assess and find some of the best research coming from the Asia-Pacific region, and, because all the raw data and abstracts to research articles behind the index are freely available on the index website, institutions and science policy makers are free to make their own interpretations and analysis of the data generated by the index, provided the index is cited as the source.

This print publication is only intended to be a guide to the index and a starting point of many different ways to mine and interpret the index data. We warmly welcome comments on the index (by email to index-feedback@natureasia.com) which is intended to be a dynamic entity that responds to user feedback. ■

NATURE PUBLISHING INDEX ASIA-PACIFIC CONTRIBUTIONS

YEAR	TOTAL ARTICLES	ASIA-PACIFIC ARTICLES	PERCENTAGE FROM ASIA-PACIFIC	ASIA-PACIFIC CORRECTED COUNT	PERCENTAGE ASIA-PACIFIC CORRECTED COUNT
2009	2,597	518	19.9%	285.45	11.0%
2010	2,865	637	22.2%	326.86	11.4%
2011	3,343	856	25.6%	470.99	14.0%

Corrected count totals the fraction of authors, on a scale of 0 to 1.0, from the Asia-Pacific in each paper.

NATURE PUBLISHING INDEX ASIA-PACIFIC IN *NATURE COMMUNICATIONS*

YEAR	TOTAL ARTICLES	ASIA-PACIFIC ARTICLES	PERCENTAGE FROM ASIA-PACIFIC	ASIA-PACIFIC CORRECTED COUNT	PERCENTAGE ASIA-PACIFIC CORRECTED COUNT
2010	149	53	35.6%	33.58	22.5%
2011	451	184	40.8%	126.26	28.0%

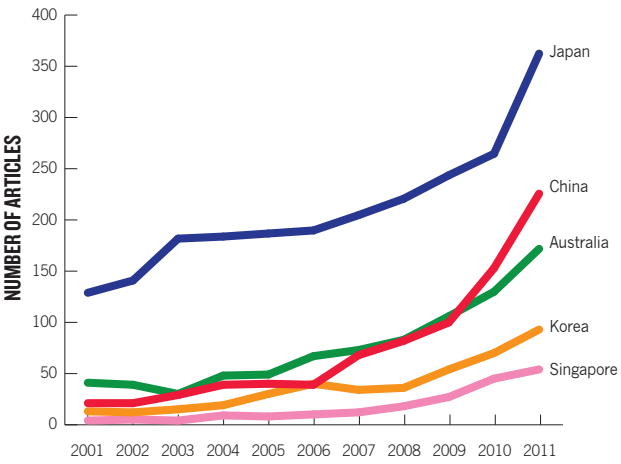
David Swinbanks PhD
Regional Managing Director
Nature Publishing Group (NPG)

NATURE PUBLISHING INDEX 2011 ASIA-PACIFIC

MONITORING ASIA-PACIFIC RESEARCH TRENDS

The twelve months of 2011 were, it could be argued, some of the most turbulent in the past decade. From the seismic upheaval in Japan to the continuing economic travails of many leading world economies, at times good news seemed to be rather thin on the ground. Viewed from the standpoint of the Nature Publishing Index, however, scientific research in the Asia-Pacific region continued to flourish.

The top five institutions in the Nature Publishing Index 2011 Asia-Pacific, and their position in the ranking, are the same as they were in 2010, with a still-dominant Japan leading China, followed by Australia, Korea and Singapore. Although all of the top five countries made gains in their publishing totals on their 2010 publishing totals, China is the real mover, increasing the proportion of the articles it publishes in Nature journals at the expense of the other four.



NATURE PUBLICATIONS ASIA-PACIFIC

The Index has become a useful record of the publishing activity of countries and institutions in the Nature journals, based on the affiliations of authors of primary research articles published. Data for the index stretching back over a decade, showing long-term trends in publication performance, is available and can be used to help in analysing the most recent data for 2011. The graph and table of articles published charts China's rise, and shows Taiwan, India and New Zealand in a tussle for sixth place. At the top of the tree, seven of Japan's institutions make it into the index's Global Top 100 and the University of Tokyo alone boasts a higher output than all of the institutions in Korea, the region's fourth-ranked country. No evidence of impact from the March 2011 earthquake and tsunami, which caused more than US$1 billion in damage to Japan's scientific infrastructure, can be seen. In fact, despite these severe events, Japan's scientists are publishing more papers than ever before.

Even though the gap between Japan and China is substantial, China continues to increase the number of articles it publishes in

NATURE PUBLISHING INDEX ASIA-PACIFIC COUNTRIES

2011				2010			2009			Total 2009-2011		
RANK	COUNTRY/TERRITORY	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	Japan	214.49	361	1	170.70	264	1	147.94	243	1	533.57	868
2	China	110.03	225	2	68.07	152	2	42.57	99	2	220.68	476
3	Australia	64.63	172	3	39.60	129	3	42.16	105	3	146.38	406
4	Korea	40.99	92	4	24.80	69	4	28.95	53	4	94.75	214
5	Singapore	13.43	53	5	11.22	44	5	9.42	26	5	34.07	123
6	Taiwan	9.68	26	7	2.93	17	8	2.66	15	8	15.27	58
7	India	8.53	30	9	1.22	10	6	6.83	19	7	16.59	59
8	New Zealand	5.30	28	6	7.31	27	7	4.04	14	6	16.65	69
9	Indonesia	0.72	3	11	0.29	1	9	0.43	3	10	1.43	7
10	Vietnam	0.60	1	–	–	–	12	0.04	1	12	0.63	2
11	Thailand	0.50	5	10	0.49	8	10	0.36	5	11	1.35	18
12	Philippines	0.31	5	14	0.01	2	–	–	–	13	0.32	7
13	Malaysia	0.31	3	–	–	–	–	–	–	14	0.31	3
14	Bangladesh	0.31	2	8	1.38	3	–	–	–	9	1.69	5
15	Myanmar	0.25	1	–	–	–	–	–	–	15	0.25	1
16	Cambodia	0.07	1	13	0.11	1	–	–	–	16	0.18	2
16	Papua New Guinea	0.07	1	–	–	–	11	0.04	1	18	0.11	2

Corrected count is a measurement that takes into account the fractional contribution of a country/territory or institution (by author affiliation) to each published article. The fractional counts are then tallied for the designated period.

Nature journals at a faster average rate than any other country in the top five, year on year, and may reach Japan within the decade.

Following the two frontrunners, Australia has consolidated its third place in the Index as a result of a 33% increase in the number of articles contributed by its researchers compared with 2010 and Korea, firmly in fourth place, continues to open up the gap on Singapore in fifth. It is at this level, however, that the order of things begins to change, with Taiwan (sixth) and India (seventh and recovering from a fall in 2010) both recording large increases in their corrected counts from 2010 to 2011 and coming closer to challenging Singapore. New Zealand is comfortably positioned in eighth place, even though its contribution fell from 2010 to 2011. Below eighth place in the index come a further seven countries from south-east Asia each contributing a handful of articles to the Index. Their appearance in the Index is in many cases sporadic and their position in the rankings is highly fluid.

In 2011, 601 institutions from 17 Asia-Pacific countries published 856 individual articles in Nature-branded primary research journals, up from 637 articles from 424 institutions in 14 countries in 2010. These figures grow year by year as the Nature publication list grows, now including the journal *Nature Climate Change* launched in 2011. It is more important than ever, therefore, to look at relative performance and not just absolute numbers when identifying trends. Again, the Asia-Pacific increased its presence in Nature journals in 2011, in terms of both the proportion of articles with an Asia-Pacific author and the corrected count of Asia-Pacific authors (see table on p. 3).

Of interest is the observation that Asia-Pacific scientists make up a high (over 40% in 2011), and increasing, proportion of authors publishing in the multidisciplinary *Nature Communications*, launched in 2010, which publishes articles that represent important advances within specific scientific disciplines, but might not necessarily have the scientific reach of papers published in *Nature* and the Nature research journals. Despite the growth in output of papers from the Asia-Pacific as a percentage of the global total (see table on p. 3), the Asia-Pacific institutions only maintained, or slightly improved, their rankings on a global scale in the Top 100. In 2010, five of the Global Top 50 institutions were from the Asia-Pacific — four from Japan and the Chinese Academy of Sciences (CAS). The figures and institutions were exactly the same in 2011. The University of Tokyo was stable in fifth place, and CAS rose from 32nd in 2010 to 23rd in 2011, but this was counterbalanced by the fall of the Japanese government research agency RIKEN from 23rd to 30th place. An additional three Japanese institutes, three from Australia, two from China and one from Korea, can be found in the index's Global Top 100.

By far the dominant publishing presence in Nature-branded primary research journals is the US, whose scientists contributed 2,031 articles with a corrected count of 1,508.01 to the Index in 2011, well ahead of the UK (575 articles, CC 283.35). The top-performing Asia-Pacific nation was Japan, which entered the Index in fourth place, ahead of France but behind Germany. Other Asia-Pacific countries come in at sixth (China), tenth (Australia), 13th (Korea) and 19th (Singapore), with Taiwan, India and New Zealand (not shown) also making the top 25 countries. Apart from Canada in seventh place, and Israel in 14th, the remaining countries in the top 25 are from continental Europe.

In 2011, scientists with an Asia-Pacific affiliation contributed a total of 856 articles to Nature-branded primary research journals, with a corrected count total of 470.99. This places it well behind North America and Europe in terms of impact in Nature journals. However, it must be borne in mind that Nature journals are largely publishing basic scientific research rather than applied research, and Asia's strengths in engineering and high-tech manufacturing may not be captured in this Index.

The strength of the Asia-Pacific economies, and the commitment of their governments to increase R&D funding as a proportion of GDP in coming years, are likely to result in Asia-Pacific countries increasing their global contribution in the future. ■

NATURE PUBLISHING INDEX GLOBAL TOP 20 COUNTRIES

2011 RANK	COUNTRY/TERRITORY	CORRECTED COUNT	ARTICLES
1	USA	1508.01	2031
2	UK	283.35	575
3	Germany	251.81	538
4	Japan	214.49	361
5	France	127.58	307
6	China	110.03	225
7	Canada	108.50	264
8	Switzerland	84.31	203
9	Netherlands	63.88	190
10	Australia	63.63	171
11	Spain	54.71	170
12	Italy	51.34	171
13	Korea	40.99	92
14	Israel	29.60	75
15	Austria	27.29	86
16	Sweden	23.86	102
17	Belgium	23.50	92
18	Denmark	20.80	80
19	Singapore	13.43	53
20	Finland	10.98	54

NATURE PUBLISHING INDEX ASIA-PACIFIC IN GLOBAL TOP 100

2011 RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES
1	Harvard University	USA	129.92	291
2	Stanford University	USA	67.48	141
3	Max Planck Institutes	Germany	62.87	184
4	National Institutes of Health (NIH)	USA	58.11	212
5	The University of Tokyo	Japan	42.88	109
20	Kyoto University	Japan	23.98	56
23	Chinese Academy of Sciences (CAS)	China	22.43	62
30	RIKEN	Japan	19.96	70
35	Osaka University	Japan	17.31	48
52	Seoul National University	Korea	11.27	32
53	Tohoku University	Japan	11.01	29
64	The University of Melbourne	Australia	9.83	46
66	Nagoya University	Japan	9.67	26
71	National Institute of Advanced Industrial Science and Technology (AIST)	Japan	9.03	22
76	University of Science and Technology of China	China	8.58	17
86	The University of Queensland	Australia	7.70	34
94	Peking University	China	7.24	21
97	Australian National University	Australia	7.18	13

See page 28 for the full listing of the Nature Publishing Index Global Top 50

JAPAN

CORRECTED COUNT: 214.49

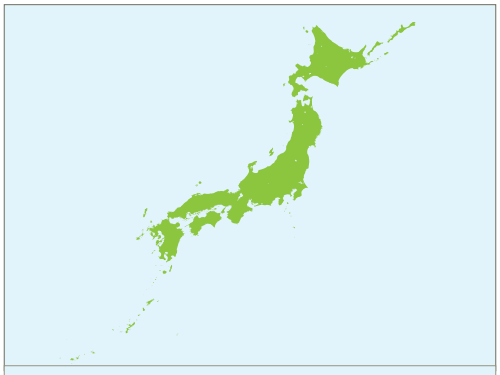
ARTICLES: 361

The Nature Publishing Index Asia–Pacific 2011 paints a picture of Japan as the research powerhouse of the Asia–Pacific region maintaining its strong lead in number one position as it has in all previous years. This achievement is all the more remarkable given the more than US$1 billion in damage inflicted on the country's universities and national laboratories by the devastating earthquake and tsunami of March 2011. Surprisingly the disaster seems to have had no effect so far on Japan's output of papers in Nature journals and output has, if anything, grown dramatically between 2010 and 2011, even faster than in previous years.

Japan once again dominated the Asia-Pacific research scene in 2011. It managed to publish well over one third of the science in the Index for the region, approximately the same as in 2010. Just one Japanese institution, the University of Tokyo, if it were a country, would rank fourth in the region — well behind Australia, but slightly ahead of Korea.

In terms of the raw number of articles contributed to Nature journals, Japan increased its output of articles in 2011 by more than 37%. Its corrected count jumped by about 26% over the same period. This is some way behind China which realised growth of 48% and 62% respectively but still only contributed about 20% of the research published in Nature-branded primary research journals. On an regional basis Japan outperformed all other countries in the Asia-Pacific with seven of its institutions ranked in the regional top ten, and four in the top five. Japanese institutions also form a significant presence in world rankings, with those same seven top-ten institutions all appearing in the Nature Publishing Index Global Top 100. The only other regional representatives in the index's Global Top 100 come from Australia (3), China (3) and Korea (1).

One of the reasons for the outstanding record of Japanese institutes is their access to by far the best infrastructure in the region, and substantial long-term funding to maintain it. Of the top five Asia-Pacific countries, Japan supports the greatest number of researchers per capita and spends the most on R&D as a proportion of GDP. Yet this proportion fell from 2010 (3.80) to 2011 (3.64), while the other top-five countries increased their proportional R&D investment.



COUNTRY PROFILE	
POPULATION	127.4 million
RESEARCHERS	838,974
GDP (PPP)	$4,430,000 million
GDP PER CAPITA	$34,831
R&D EXPENDITURE (%GDP)	3.64%

SOURCE: MEXT, IMF, UN

OVERCOMING ADVERSITY

The fact that Japan continues to perform so strongly in the Nature Publishing Index is all the more impressive considering the damage wrought to its civil and research infrastructure by the magnitude 9.0 Tohoku earthquake that struck the country's Pacific coast on March 11th 2011 killing and injuring an estimated 25,000 people. In addition to the appalling toll on human life, Japanese universities and national laboratories suffered damage costing more than US$1.1 billion according to Japanese government estimates. Of this about US$910 million was borne by Tohoku University in Sendai, ranked number five in the Nature Publishing Index for Japan number 53 in the Global Top 100, which was situated only 130 km away from the epicentre. The earthquake severely damaged 28 of its buildings, destroyed about 7,000 pieces of laboratory equipment, and shut down the university completely for nearly two months.

Most of the remaining damage was suffered by facilities in and around and to the north of Tokyo, approximately 350 km away including some renowned institutions, such as the Photon Factory synchrotron at Tsukuba and the Japan Proton Accelerator Research Complex (J-PARC) at Tokai, which shut down for nine months. That this major centre could re-open after only a relatively short time is testament to the recovery efforts of both the Japanese government and the international science community, which provided much collaborative assistance to get things up and running again. Despite the battering meted out by the earthquake and tsunami there has been no apparent effect of Japanese publications in Nature-branded primary research journals

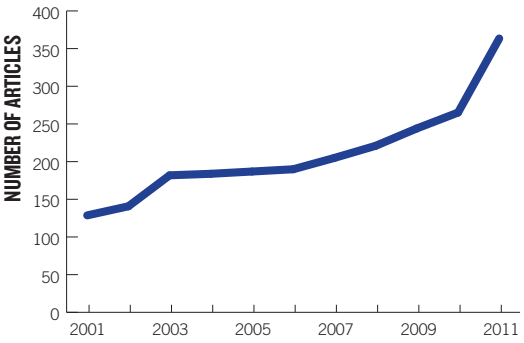
NATURE PUBLISHING INDEX JAPAN

2011 RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	ASIA-PACIFIC RANK	2010 RANK	CORRECTED COUNT	ARTICLES	2009 RANK	CORRECTED COUNT	ARTICLES	Total 2009-2011 RANK	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	42.88	109	1	1	36.51	84	1	29.47	70	1	108.87	263
2	Kyoto University	23.98	56	2	3	16.97	35	2	19.57	44	2	60.52	135
3	RIKEN	19.96	70	4	2	19.76	53	4	12.56	42	3	52.28	165
4	Osaka University	17.31	48	5	4	13.33	35	3	17.04	37	4	47.68	120
5	Tohoku University	11.01	29	7	5	8.03	22	5	7.08	23	5	26.12	74
6	Nagoya University	9.67	26	8	6	5.44	14	6	4.86	13	6	19.97	53
7	National Institute of Advanced Industrial Science and Technology (AIST)	9.03	22	9	7	4.54	18	11	2.09	9	7	15.66	49
8	Kyushu University	4.58	19	19	11	2.35	10	8	3.60	12	8	10.53	41
9	National Institute for Material Science (NIMS)	4.52	12	20	13	2.08	7	10	2.31	5	11	8.90	24
10	Hokkaido University	4.26	16	21	8	4.05	8	12	1.67	5	9	9.97	29

– on the contrary they continue to increase by leaps and bounds. That said, it may be many months more before the full impact of the events of March 11th are fully reflected in the country's scientific output.

LEADING THE WAY

Last year's report noted the stability in the positioning of the top Japanese institutions, and this situation continued in 2011. As in the previous year, the top five Japanese institutions remained the same, with the same four institutions also featuring in the top five places of the Asia-Pacific-wide index. Although the University of Tokyo again topped the regional table and Kyoto University climbed one place to second spot, the Chinese Academy of Sciences continued to advance in the ranks, climbing from fifth to third place in 2011, pushing public research agency RIKEN into fourth and Osaka University down one place to fifth position.



NATURE PUBLICATIONS JAPAN

Within Japan, and indeed the Asia-Pacific region as a whole, the University of Tokyo continues its dominance as the most productive research institution. In 2011, it became the first organization in the Asia-Pacific to contribute more than 100 articles published in the Nature family of journals with 109 articles up from 84 in 2010. As noted last year, the University of Tokyo shows strength across the broad range of Nature journals, from genetics and molecular biology through geoscience and astronomy to materials science, chemistry and physics. Both the number of its research articles and the corresponding corrected count are nearly double that of the next ranked institution in the country and region, Kyoto University, which in 2011 reasserted itself over RIKEN, relegating the latter to third place. The research profile of fourth-placed Osaka University, which maintained its ranking from 2010, strongly resembles that of Kyoto University, its neighbour in the Kansai region of Japan. Strong in the life sciences, and in particular molecular biology and genetics, they are also heavily involved in chemistry and geosciences.

For the third year in a row, Tohoku University retained its fifth position in the ranking of Japanese institutions thanks to a robust showing in life science disciplines and its traditional strength in areas such as materials science, chemistry and engineering. The importance of these latter disciplines to the institution's performance in the Nature Publishing Index are attested to by its second place ranking amongst Asia-Pacific nations publishing in *Nature Materials*. Tohoku University was the institution most directly affected by the March 11th earthquake and although it has made a rapid initial recovery it will be interesting to see whether it will be able to maintain its position over the next few years.

In 2011, the lower half of the top-ten Japanese institutions also remained relatively stable. Nagoya University and the National Institute of Advanced Industrial Science and Technology retained sixth and seven places, respectively, with Kyushu University at eighth exchanging places with Hokkaido University which dropped two places to tenth. The only newcomer to the top ten is the National Institute for Materials Science (NIMS) at nine. With its strengths in physics and materials science, it has been steadily climbing the rankings as an important contributor to *Nature Materials*, *Nature Physics* and the new *Nature Communications*.

The institution NIMS replaced in 2011 was Kanazawa University, on the west coast of the main Japanese island of Honshu, which plummeted from ninth to 80th in Japan. Interestingly, NIMS is the only institution in the 2011 top ten which does not make the top ten on the basis of three-year average being ranked eleventh, behind Keio University in tenth position.

SURGING AHEAD

The 2010 Nature Publishing Index section on Japan suggested that in view of the funding and infrastructure advantages enjoyed by the country, it should be doing even better in the Index than it already was and warned against complacency. On an analysis of the data for 2011, such finger-wagging would seem to have been out of place as Japan once again appears to be surging ahead. The picture is complicated, however, by the consideration of past governmental initiatives such as the large-scale economic stimulus package implemented in the wake of the financial downturn (termed the 'Lehman Shock' in Japan) that hit the world economy in 2008–2009 and whose benefits may only now be making themselves known. Whatever the case, Japan seems set to top the Asia-Pacific region for some time to come. ■




Kyoto University

A HUB OF SCIENCE AND TECHNOLOGY RESEARCH FOUNDED ON 1,200 YEARS OF TRADITION AND CULTURE

Kyoto University has always been devoted to the tradition of academic excellence that has flourished with the city of Kyoto's historical cultural heritage. The university continues to generate cutting-edge knowledge through its dedication to freedom and autonomy in research. As a university that boasts many graduate schools, faculties, research institutes and centers in a wide spectrum of fields, Kyoto University will continue to strive for diverse development in basic and applied research spanning the humanities, sciences and technologies, while seeking to integrate its research activities into government and private sector projects.

Intrinsic strength of Kyoto

When Kyoto became the capital of Japan in 794, the city's culture blossomed. Possibly the world's first novel, *The Tale of Genji*, written in the early 11th century and attributed to Lady Murasaki Shikibu, is a classic work of Japanese literature set in Kyoto. The city has today become a living art museum for its scenery, temples, shrines and gardens that are backed by a historically refined beauty. Many cultural features of Kyoto continue to thrive: the Gion Festival is still held annually, the tea ceremony is still taught, and development of ikebana—the Japanese art of flower arrangement — and Kyoto cuisine remains popular. In 1994, 17 properties of Kyoto's wooden religious architecture and traditional gardens were listed as UNESCO World Heritage sites. They are known as the "Historic Monuments of Ancient Kyoto".

Not only is Kyoto a preserver of old traditions and culture, it is also a great contributor to modern technology and industrial development. For example, semiconductors and liquid crystal monitors have been developed using techniques of the Kiyomizu Pottery industry dating back some 400 years. Traditional skills developed in Kyoto throughout its 1,200 years of history, are now being applied in cutting-edge technologies. Kyoto stands as the hub of knowledge and culture in Japan.

Kyoto is currently home to a total of 37 colleges and universities, and is populated by as many as 140,000 students. On a per capita basis, this is the highest concentration of university students in Japan.

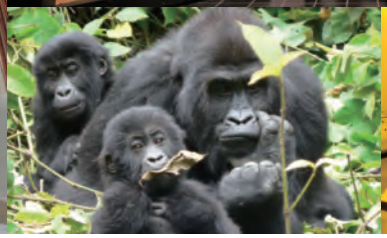
Kyoto University Expands the Boundaries of Research

The broad scope of research in chemical, physical and life sciences and technologies at Kyoto University spans mathematics, physics, chemistry, biology, medicine, pharmaceutical sciences, agricultural sciences, environmental and energy studies, informatics, engineering, and many more diverse subjects. Among the humanities and social sciences are some of the university's most unique research areas in fieldwork, including primate studies and Asian and African studies. Research in these areas has resulted in numerous breakthrough discoveries. This is reflected in Kyoto University achieving a global ranking of 25 in the *Nature Publishing Index 2010*.

Advances in science and technology, coupled with the environmental issues we face today, are changing the ways in which humanity and nature are perceived. In this age of such profound change, Kyoto University is committed to pursuing a harmonious coexistence between humans and nature.

Hakubi Project Supporting Young Researchers

Kyoto University established an institutional home for the development and implementation of the Hakubi Project to foster and support young researchers with superb creativity, a broad perspective and a flexible mindset. The Hakubi Project welcomes applications from researchers all over the world. There are no restrictions

to nationality, and the project is open to young researchers in every range of basic and applied studies in any academic field. Every year, about 20 researchers are recruited through peer review and interview screenings, and are employed as program-specific faculty members (associate professor or assistant professor) for five years. The program is designed to support research activities by providing uninterrupted, stimulating environments in collaboration with faculties, graduate schools, institutes and research centers at Kyoto University. The call for applicants will commence in early March, 2012, and end in early May, 2012.

Industry–Academia Collaborations

Kyoto University actively promotes innovative research activities that serve as a foundation for global academic studies, while striving to become a reference source of knowledge and technology for the future of both the nation and humanity.

In 2004, when Kyoto University became a National University Corporation together with all other national universities in Japan, it reinforced its mission to encourage the dissemination of knowledge and technology through industry–academia collaborations. The Office of Society-Academia Collaboration for Innovation (SACI) was established to carry out this mission as Kyoto University's technology transfer and innovation division. By making use of the extensive research potential of the university, the SACI has for the past 10 years fulfilled the responsibilities of this mission, providing a solid foundation for cutting-edge research and making the most of its revolutionary innovations.

The SACI has since forged many international partnerships between high-level academic and technology-transfer organizations. The resultant global research and innovation platform allows industry links to identify promising academic research seeds.

Another activity involves the maintenance of an educational platform that encourages entrepreneurship and future business leaders to explore effective and successful business applications of academic research. It also works closely with the University Venture Funds, promoting spin-out venture companies. Other activities include offering Collaborative Research Courses to enhance academia–industry collaboration projects. These courses are supervised by the deans and research directors of the university and are carried out by the faculty.

Through these activities, the SACI has attained a high level of research collaboration with industries, amounting to approximately 900 cases with revenue of over US$80 million, and licensing revenue of over US$2 million in 2011. Approximately 400 disclosures of inventions resulted, with over 200 patents applied for in the same year. These figures place Kyoto University among the top few of all academic institutions in Japan.

Kyoto University endeavors to challenge its members to continue to develop of science and technologies in consonance with the aesthetics developed over a millennium in the city of Kyoto.

Further information about Kyoto University and the SACI is available via the details provided below.

Lastly, Kyoto University would like to thank all those who supported and offered words of encouragement after the Tohoku earthquake and the accident at the Fukushima nuclear power plant. ■

Hakubi
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CHINA

CORRECTED COUNT: 110.03
ARTICLES: 225

China has continued its rapid growth in high-quality basic scientific research to consolidate second spot in the Nature Publishing Index Asia-Pacific in 2011. In comparison with 2010, China has drawn closer to Japan at the top and distanced itself from third-placed Australia. China is still the fastest growing of the top five Asia-Pacific countries — and the only one of the top five nations that increased its share of the total number of articles published in Nature-branded primary research journals in 2011.

The huge expansion of research in China is the result of significant increases in funding over the past 15 years, and the Chinese government intends to sustain the growth. The Ministry of Science and Technology released its 12th Five-Year Plan for Science and Technology Development in July 2011, committing to boosting China's innovation capacity and competitiveness in high-tech sectors. China now has the world's second largest economy and the second highest investment in research and development in absolute terms, behind the US. China is also second behind the US in the total number of articles it publishes in international journals, although it ranks only sixth in Nature group publications globally, behind the US, UK, Germany, Japan and France.

China's research and development expenditure as a proportion of GDP in 2011 was 1.54% — lower than that of the US and the other top five countries in the Asia-Pacific — but the Five-Year Plan sets a target of 2.2% by 2015. Over the past few years, China's economy has continued to grow at 9–10% per annum, and its R&D spending is growing even faster at an average of 12% each year. This is significantly higher than the growth experienced in the US, Europe or the other top five Asia-Pacific countries. Yet, China's GDP per capita, at $8,304, is much lower than its regional rivals, all above $31,000.

COUNTRY PROFILE	
POPULATION	1,334.7 million
RESEARCHERS	1,592,420
GDP (PPP)	$11,195,000 milllion
GDP PER CAPITA	$8,304
R&D EXPENDITURE (%GDP)	1.54%

HONG KONG SAR			
POPULATION	7.0 million	GDP PER CAPITA	$45,277
RESEARCHERS	24,100	R&D EXPENDITURE (%GDP)	0.76%
GDP (PPP)	$322,000 milllion		

SOURCE: MEXT, IMF, UN, CENSUS AND STATISTICS DEPARTMENT

PRIME MOVER

China overtook Australia to claim second place in the Nature Publishing Index Asia-Pacific on corrected count in 2008, and in terms of the raw number of articles published in 2010. China's continuing rise in the research rankings is reflected in the increasing number of Chinese research institutions placed near the top of the Asia-Pacific rankings — from seven in the top 50 in 2009 (with one in the top ten) to 14 in the top 50 in 2011. Over 2009–2011, China produced just over one-fifth of the articles published in Nature group publications by Asia-Pacific countries.

Almost 100 institutions from China that did not make the 2010 ranking were included in the 2011 rankings (nine had previously appeared in 2009). A total of 158 Chinese institutions published in Nature-branded primary research journals, showing an increasing breadth of high quality research across the country. Even when the Chinese Academy of Sciences (CAS) — a conglomerate of 117 institutes of which 97 are research institutes — is counted as a single institute, Chinese institutions comprise more than a quarter of those contributing to the Asia-Pacific region. This compares with Japan's 33%, Australia's 13%, Korea's 9% and India's 6% (Singapore, the fifth highest ranked country, provides only 2% of the research institutes).

The CAS is the premier research institute in China. With 62 articles published in 2011 compared to 40 in 2010, the CAS has continued its steady rise in the Asia-Pacific rankings, from fifth in 2009 to fourth in 2010 and now third. This consistency has placed it fifth in the Asia-Pacific in the three-year average (2009–2011) and 23rd in the Nature Publishing Index Global Top 100 listing for 2011. The University of Science and Technology of China (in 76th place) and Peking University (94th) are the only other Chinese institutions in the index's Global Top 100 listing.

In another notable development, due to its steady ascent, the CAS looks likely to overtake Japan's Kyoto University for second place on corrected count in 2012. In 2010 and 2011, CAS researchers contributed to more articles than did Kyoto University researchers, although the latter ranked ahead of their Chinese counterparts on corrected count.

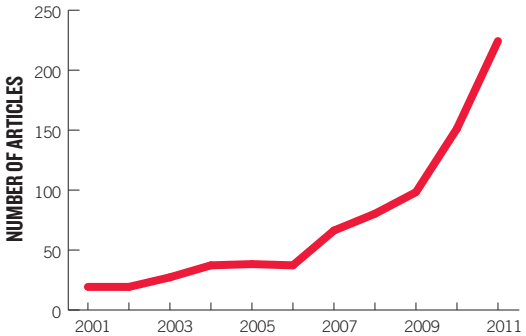
NATURE PUBLISHING INDEX CHINA

2011 RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	ASIA-PACIFIC RANK	2010 RANK	CORRECTED COUNT	ARTICLES	2009 RANK	CORRECTED COUNT	ARTICLES	Total 2009-2011 RANK	CORRECTED COUNT	ARTICLES
1	Chinese Academy of Sciences (CAS)	22.43	62	3	1	13.17	40	1	12.01	31	1	47.61	133
2	University of Science and Technology of China (USTC)	8.58	17	11	3	3.83	8	4	2.67	8	3	15.08	33
3	Peking University	7.24	21	13	5	3.46	17	3	2.82	9	4	13.51	47
4	Tsinghua University	6.36	16	15	2	6.15	16	2	3.32	9	2	15.83	41
5	Hong Kong University of Science and Technology (HKUST)	3.86	5	23	9	1.86	3	–	–	–	10	5.72	8
6	Xiamen University	3.77	6	25	10	1.83	3	11	1.00	1	8	6.59	10
7	Shanghai Jiao Tong University (SJTU)	3.73	21	28	20	0.99	4	5	1.76	10	9	6.48	35
8	The University of Hong Kong	3.58	12	29	7	2.17	8	8	1.36	5	6	7.10	25
9	Nanjing University	3.01	11	35	6	3.16	8	7	1.41	5	5	7.58	24
10	Beijing Genomics Institute (BGI), Shenzhen	2.97	11	36	4	3.59	9	19	0.52	1	7	7.08	21

LARGE-SCALE SCIENCE

As in previous years the composition of the top four places in the Nature Publishing Index in 2011 was relatively stable with three of the featured institutions appearing in this section of the table for the third successive year.

The number one-ranked Chinese institution in the Nature Publishing Index in 2011 is again the Chinese Academy of Sciences (CAS) — a fact that is hardly surprising given its position as the largest research institution in the world. The importance of its impact as a research institution is shown by the fact that 17 of its 62 articles were published in the flagship journal *Nature*, ranking it second in the Asia-Pacific region for publications in that title. The CAS publications mostly came from the Shanghai Institutes for Biological Sciences (15 articles) and the Institute of Physics (11 articles), but 31 institutes under the CAS umbrella published in Nature-branded primary research journals in 2011. This is up from the 27 that contributed in 2010. Many of the Nature articles were on palaeontology, but other fields included astronomy, physics, earth science and stem cell research. The CAS also published five articles in *Nature Structural & Molecular Biology* and four in *Nature Immunology*, reflecting its strength in the life sciences.



NATURE PUBLICATIONS CHINA

China's second-ranked institute in 2011, the University of Science and Technology of China (USTC), is one of two universities affiliated with the CAS but is ranked separately. USTC is now placed 11th in the Asia-Pacific (and 76th globally), up from 16th in 2010, reflecting a doubling of the raw number of articles published from eight in 2010 to 17 in 2011. This is a relatively small number of articles for the level of its corrected count, indicating the strength within the institution. UTSC ranked second in the Asia-Pacific for publications in *Nature Photonics* and fourth in *Nature Physics*.

On the three-year average, the prestigious Tsinghua University ranks second in China, and tenth in the Asia-Pacific, but in 2011, dropped to fourth place in China with 16 papers in the Nature Publishing Index, of which five were papers in *Nature*. The Beijing-based institute has strengths in life sciences, particularly structural and molecular biology, and physics. Although the number of articles published by Tsinghua University remained steady at 16, and its corrected count increased slightly from 2010, it was overtaken in 2011 by UTSC and Peking University. The latter more than doubled its corrected count from 2010 to 2011, which brought it up from fifth to become the third-ranked Chinese institution. Peking University publications covered a range of fields, including genetics, physics, chemical biology, earth science, materials and neuroscience.

ONWARD COURSE

Two institutions rose rapidly in the rankings last year — the Hong Kong University of Science and Technology (HKUST) and Shanghai Jiao Tong University (SJTU). HKUST, which was established in 1991, has been making steady upward progress. It did not appear in the 2009 rankings, was ranked ninth in China in 2010, and fifth in 2011, with five articles and a high corrected count of 3.86. SJTU, a large university with more than 40,000 students, has fluctuated dramatically in its publication record. In 2011, the institution published 21 papers in Nature-branded primary research journals, of which 12, including several genome-wide association studies of diseases, were in *Nature Genetics*. This contrasted with 2010, when the institution ranked 20th in China with four articles and 2009 when ten articles pushed it into fifth place in the country. In between these two, came Xiamen University which consolidated its spot in the top ten. Although its total haul of six articles in 2011 was comparatively modest compared with most of the other institution in the top echelon it was double the number produced in the previous year and a huge improvement on its single paper in the Index in 2009. Of the six articles contributed to the Index in 2011, three were published entirely by Xiamen University researchers giving a high corrected count and propelling the institution up four places on its 2010 ranking. On a smaller scale, BGI Shenzen (formerly the Beijing Genomics Institute) dropped from fourth to tenth place, with ten articles published including the genome sequences of the potato, naked mole rat, Chinese hamster, the roundworm *Ascaris* and two species of macaque. In 2009, BGI Shenzen published only one Nature paper and it makes it into seventh place in the three-year average rankings, largely on the basis of articles published in 2010 and 2011.

Taking a wide view, as China improves the quality of its academic teaching and the impact of its research publications, the country's continued economic and R&D growth is expected to fuel further increases in its publishing contribution. There is still a sizeable gap between China and Japan above it but, on current trends, China looks set to challenge its eastern neighbour for top spot. ■

AUSTRALIA

CORRECTED COUNT: 64.63

ARTICLES: 172

Maintaining its third place in the Nature Publishing Index Asia–Pacific 2011, Australia continues to be a pivotal player on the regional research stage. However, despite its strong lead on Korea and Singapore, Australia continues to be outpaced by Japan and China, which take first and second place respectively. That said, considering the much smaller number of researchers in Australia compared with the top two it does remarkably well in the Index.

At a time when both the amount and scope of the science published by *Nature* is expanding year to year, Australia has consolidated its position as the third most productive country in the Asia-Pacific region for primary research. In absolute terms, with 172 articles in the Nature-branded primary research journals in 2011, Australia comes behind Japan (361) and China (225), but is well ahead of fourth-placed Korea (92 articles). The corrected count figures reflect the same relative positions. Although we reported last year that Australia could be in danger of being reeled in by the countries immediately below, this no longer appears the case. In 2011, it comfortably increased its lead over the publication rates of fourth-placed Korea and fifth-placed Singapore.

Australia's measures and rank partly reflect the island continent's geographic position, and the place of research in its society. Because of its unique environment, climate and sense of space, much research is Australia-specific and of a practical nature: assisting local agriculture; coming to terms with profoundly different ecosystems; overcoming the "tyranny of distance"; detecting and extracting minerals. In many cases, despite the growing coverage of the research journals, these are not the kinds of studies that are published in *Nature*. This is possibly one of the reasons that the large Australian government research body, CSIRO, does not tend to rank as highly as regional peers, such as Japan's RIKEN and China's Academy of Sciences.

By virtue of its position and historical links, Australia plays a role as a bridge between the West and Asia and between developed and developing worlds. James Cook and Charles Darwin universities, along with institutions in Singapore, for instance, are some of the few first-world research organizations located in the tropics — a region which is home to about 40% of the world's population. And, as was noted in the articles accompanying the 2010 Nature Publishing Index, Australia's size, health system and research traditions make it an ideal partner in international biomedical studies, such as genome-wide association studies and clinical trials.

COUNTRY PROFILE	
POPULATION	22.3 million
RESEARCHERS	91,617
GDP (PPP)	$925,000 million
GDP PER CAPITA	$41,089
R&D EXPENDITURE (%GDP)	2.21%

SOURCE: MEXT, IMF, UN

TOP FIVE CLOSELY PLACED

Once again, the evenness of Australia's top institutions is evident in the corrected count figures, resulting in a shuffle of places in the top five. In general, however, the same names keep cropping up each year. The University of Melbourne is back at the top of the list again — up from sixth last year. The perennially well-performing University of Queensland is second for the third year in a row and also holds the same position in the three-year average. The Australian National University (ANU) comes in at three, up from seventh. These three are the only Australian institutions to appear in the Nature Publishing Index Global Top 100 — Melbourne at 64, Queensland at 86 and ANU at 97. Last year's premier institution, the University of Sydney, has dropped to fifth, with Monash University, another consistent high-flyer, in between at fourth.

Within this top five are good examples of two distinct types of Australian research institutes — collaborators and creatives. The universities of Melbourne, Queensland and Sydney are prime examples of collaborators — with 46, 34 and 30 papers apiece. At these institutions, researchers contribute to publications often as part of much larger international teams. Not surprisingly, these universities are all strong in biomedical research, a field in which Australia has a long history of international collaboration. The Australian National

NATURE PUBLISHING INDEX AUSTRALIA

2011				ASIA-PACIFIC	2010			2009			Total 2009-2011		
RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	RANK	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	The University of Melbourne	9.83	46	8	6	2.60	17	3	4.26	23	1	16.69	86
2	The University of Queensland	7.70	34	12	2	4.38	16	2	4.35	18	2	16.44	68
3	Australian National University	7.18	13	14	7	2.17	10	1	4.65	15	3	14.01	38
4	Monash University	5.24	17	17	3	3.24	10	6	3.05	10	5	11.53	37
5	The University of Sydney	5.00	30	18	1	4.40	23	5	3.13	9	4	12.54	62
6	The University of Western Australia	4.08	22	22	18	0.49	15	8	1.41	11	8	5.98	48
7	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)	3.81	14	24	5	2.62	11	9	1.12	6	6	7.55	31
8	The University of New South Wales	3.02	16	34	4	2.80	15	10	1.08	5	7	6.90	36
9	Queensland Institute of Medical Research (QIMR)	1.79	15	51	14	0.83	16	7	2.42	12	10	5.04	43
10	James Cook University	1.26	7	65	42	0.07	2	58	0.04	1	20	1.37	10

University and Monash University, on the other hand, only published 13 and 17 papers in Nature-branded primary research journals respectively, but their researchers typically played a much larger creative role in each study, leading to a competitive corrected count.

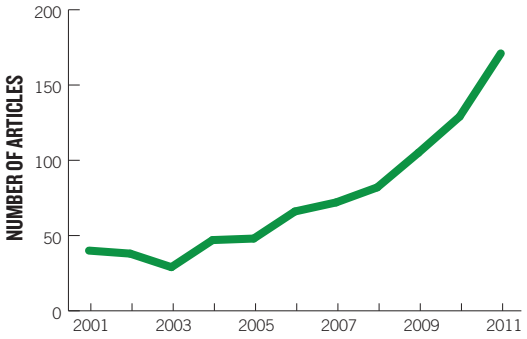
Filling out Australia's top ten are two institutions noted last year as up-and-comers — the University of Western Australia (up from 18th to sixth) and the Queensland Institute of Medical Research (14th to ninth). CSIRO and the University of New South Wales, both in the top five last year, have dropped to seventh and eighth respectively.

BUILDING ON REEF RESEARCH

The real surprise packet has been the rise and rise of James Cook University (JCU) to number 10 (up from 42 in 2010). Interestingly, this seems to reflect more than its strategic position in the tropics next to the Great Barrier Reef. Its seven papers in Nature-branded primary research journals in the past year span geoscience and chemistry, as well as climate change and tropical ecology. In the past three years, on an Asia-Pacific regional basis, JCU has gone from a ranking of 351 to 65, and is continuing to rise rapidly.

The three institutes to drop out of the Austalia top 10 — Macquarie University, the Walter and Eliza Hall Institute of Medical Research (WEHI), and Griffith University — are still within striking distance at 11th, 14th and 16th respectively. For WEHI, which in 2009 was ranked fourth, this fall probably represents its narrow base as a specialised medical research institute at a time of increased opportunities for researchers from broader-based institutions to publish in a widening range of Nature-branded primary research journals.

As we noted in last year's report, this evenness at the top prevents any single institution from dominating the nation and carving out a significant international presence. The Australian figures also demonstrate that institutional history, size and experience contribute much towards establishing research excellence. The only member of the country's prestigious Group of Eight institutions not to make it into the top ten was the University of Adelaide which came in close-by at 13. The same institution is one of the country's oldest universities — known as the "sandstone universities" — and was one of only two such not to rank in the top ten, the other being the University of Tasmania in 12th place.



NATURE PUBLICATIONS AUSTRALIA

Australia continues to show strength in the bio-medical sciences — immunology, medicine, genetics, molecular and general biology; in the environmental sciences — climate change, ecosystem research and ocean research; in geosciences; and particularly this year in physics. Of the top institutions, the University of Melbourne's most significant individual submissions have come in physics, nanotechnology and immunology, but its broadest general contributions have been in genetics and molecular biology. ANU also has made significant contributions in physics, immunology and molecular biology.

The University of Sydney, which last year shot to the head of the pack on the back of five high-scoring publications in geosciences, this year only contributed one paper in that field, but is showing considerable strength in astronomy. Monash University and the University of Queensland are traditionally strong in immunology, genetics, and biotechnology. To that Queensland has added articles in environmental biology and research which opens up the possibility of producing antibiotics in sunflowers and packaging them as seeds. Monash is particularly strong in stem cell research, to which it has added geoscience.

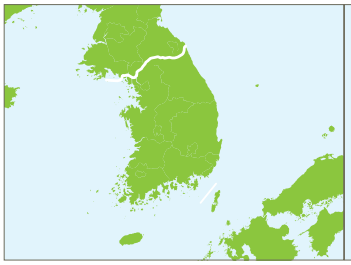
STRENGTH TO STRENGTH

The gradual strengthening of Australia's research and development culture would seem to be the result of bilateral support at both the Federal and State government levels where science has been seen as a future provider of wealth and jobs. In the 2004–2005 federal budget, A$542 billion was allocated over six years under the National Collaborative Research Infrastructure Strategy towards upgrading the nation's science infrastructure. In May 2009 a four-year program, known as the Super Science Initiative, included an additional A$901 million for infrastructure. Most of the states, particularly Victoria and Queensland, have also put serious money into assisting R&D over the past decade. Australia spent 2.21% of its GDP on research and development in 2010 — less than the other top five countries except for China — but of those five countries it showed the greatest proportional increase from 2010 to 2011. These funds go into hard-working hands. Australia's 91,000 researchers publish more papers per researcher and per capita than those of any other Asia-Pacific nation apart from Singapore, making them among the most productive in the region. ■

KOREA

CORRECTED COUNT: 40.99

ARTICLES: 92



COUNTRY PROFILE	
POPULATION	48.9 million
RESEARCHERS	236,137
GDP (PPP)	$1,541,000 million
GDP PER CAPITA	$31,404
R&D EXPENDITURE (%GDP)	3.36%

SOURCE: MEXT, IMF, UN

Firmly retaining its fourth-place position in the 2011 Asia-Pacific Nature Publishing Index, Korea performed strongly not only in the physical sciences as in previous years but also in life sciences, with a particular focus on genetics and neuroscience. An apparent permanent fixture in the top five, Korea extended its lead over Singapore but fell further behind Australia above it.

With more than 90 articles and a corrected count of 40.99, and registering year-on-year gains, Korea has established a healthy pace as the fourth-placed nation in the Nature Publishing Index. Its publication rate in the Nature-branded research journals is still growing strongly both in terms of raw articles published and on corrected count. In the past year, it easily out-paced fifth-placed Singapore, but made little headway in catching third-placed Australia. In other words, Korea is now firmly entrenched in its position.

Much of the progress in Korean science and technology research in previous years was generally ascribed to applied, incremental research. However, the data for 2011 suggests that original basic research is also gaining in importance in Korea — a 33% increase in the number of articles published in Nature-branded primary research journals is paired with a 65% jump in corrected count, suggesting that much of its increase in research output is to do with home-grown ideas, and does not depend on collaboration.

As in past years, Korea still performs strongly in journals related to the physical sciences — *Nature Materials*, *Nature Nanotechnology*, *Nature Photonics* — but the proportion of high level life-sciences work in fields such as genetics and neuroscience is growing. And the new journal of *Nature Communications*, where researchers can talk shop with specialists in their field, has become very popular. Seoul National University (SNU) is the fourth-ranked Asia-Pacific institution in that journal.

While traditionally more fluid in order than the three countries above it in the Index, the top Korean institutes are becoming more settled year to year. Four of the top five Korean institutes are the same in 2011 as in 2010, and the other one — the research arm of Korea's largest company, the industrial conglomerate Samsung — returns after a surprising drop to 19th in 2010.

The research institutions are dominated by Seoul National University which, in a similar way to Tokyo University in Japan, has strength across most of the research spectrum. SNU is the only Korean institution in the Nature Publishing Index Global Top 100 at 52. Having contributed to 32 articles in Nature-branded primary research journals (up from 18) for a corrected count of 11.27 (up from 4.99), SNU is now stable in its spot on the Asia-Pacific ladder, and well over twice as productive as any other Korean institute. It ranks sixth in 2011 in the Asia-Pacific region and seventh over the past three years.

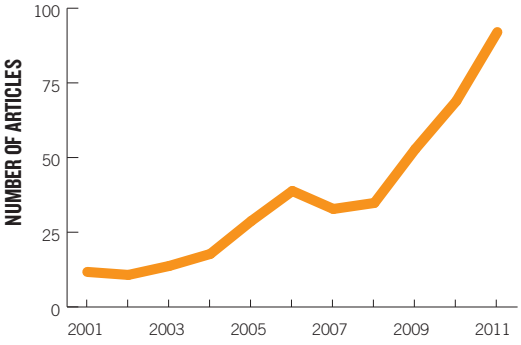
In second and third positions are the Korean Advanced Institute of Science and Technology (KAIST) and the energetic young Pohang

NATURE PUBLISHING INDEX KOREA

2011					2010			2009			Total 2009-2011		
RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	ASIA-PACIFIC RANK	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	Seoul National University	11.27	32	6	1	4.99	18	1	5.95	13	1	22.21	63
2	Korea Advanced Institute of Science & Technology (KAIST)	3.74	13	26	2	4.62	11	3	2.43	4	2	10.79	28
3	Pohang University of Science and Technology (POSTECH)	3.73	8	27	4	1.82	6	5	2.01	8	3	7.56	22
4	Samsung	2.86	5	39	19	0.23	2	2	2.48	5	5	5.57	12
5	Korea University	2.71	12	41	5	1.58	5	4	2.15	8	4	6.44	25
6	Ewha Womans University	1.75	8	53	12	0.53	3	8	1.24	2	7	3.52	13
7	Hanyang University	1.44	6	59	6	0.85	2	14	0.66	2	9	2.95	10
8	Sungkyunkwan University	1.36	4	63	3	2.87	6	12	0.93	4	6	5.16	14
9	Yonsei University	1.20	6	71	11	0.55	6	7	1.27	3	8	3.02	15
10	Ajou University	0.78	2	99	14	0.48	3	36	0.03	1	14	1.29	6

University of Science and Technology (POSTECH), the latter up from fourth. Fourth position is now occupied by the resurgent Samsung, which has one of the highest ratios of corrected count to published articles of any institute in the Asia-Pacific, followed by Korea University located in northern Seoul, which maintained its position as the fifth-ranked institution in Korea.

The composition of the next five is a little more interesting, and variable from year to year. Four technological research institutes have moved out from last year's rankings to be replaced by universities. This leaves a top ten with one public research body, KAIST, one corporation, Samsung, and eight universities, perhaps reflecting a transition in Korea from essential, practical technological research to broader endeavours.



NATURE PUBLICATIONS KOREA

Three newcomers enter the lower five, and they are a diverse group. Sixth-placed Ewha Womans University is the largest female educational institution in the world and, among its alumnae, numbers many of the most influential women in the country. Most of its eight articles published in Nature-branded primary research journals in 2011 are in the life sciences, but they also included chemical biology and physics. The university itself incorporates a relatively new, but large College of Engineering. Yonsei University, the third of Korea's prestigious SKY (Seoul National, Korea and Yonsei) universities has moved into ninth place, up from 11 in 2010, but still not as high as its seventh place in 2009.

The last of the newcomers at number ten (up from 14) is Ajou University, which was established as an engineering school in the early 70s with the help of the French, and developed into a broader university with a significant endowment from the CEO of the Daewoo conglomerate.

First entering the top ten in 2010, Hanyang University has moved down a place to seventh position in 2011, and Sungkyunkwan University — down to eighth place from number three last year — is the only institute to have tumbled out of the top five. ■

SINGAPORE

CORRECTED COUNT: 13.43

ARTICLES: 53

COUNTRY PROFILE	
POPULATION	5.1 million
RESEARCHERS	27,841
GDP (PPP)	$309,000 million
GDP PER CAPITA	$59,582
R&D EXPENDITURE (%GDP)	2.61%

SOURCE: MEXT, IMF, UN

With core research strengths in biomedical science, IT and engineering, Singapore maintains its position as a top-five-ranked country in the Asia-Pacific rankings of the Nature Publishing Index. The widening gap between Singapore and fourth-ranked Korea and the notable rise of Taiwan and India in 2011 however, means that the island nation faces challenges from above and below.

Despite a small population of just over 5 million and a small number of institutions publishing in Nature-branded primary research journals, Singapore ranks fifth in the Asia-Pacific region in 2011. Its three top institutions, the Agency for Science, Technology and Research (A*STAR), the National University of Singapore (NUS) and Nanyang Technological University (NTU) are all ranked in the top 50 in the Asia-Pacific in terms of three-year averages — at 15th, 18th and 35th, respectively.

But the gap between Singapore and the top four countries — Japan, China, Australia and Korea — is significant and widening. In 2011, Singapore lost ground on fourth-ranked Korea, and it is now facing a challenge from sixth-ranked Taiwan which increased its publication to 26 articles, but whose less stable record means that it is in eighth place on the basis of three-year averages. With a big increase in 2011 publications, India is not far behind in seventh spot.

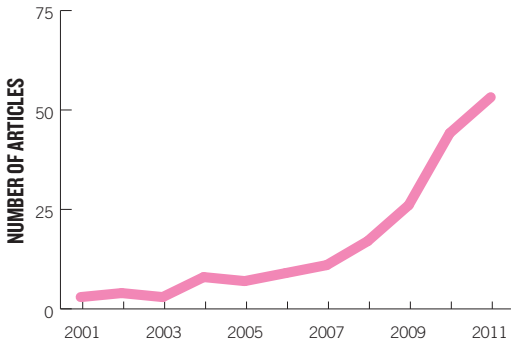
For the numbers of articles published, Singapore's corrected count is relatively low — an indication of the multinational, collaborative nature of research in Singapore, which is now home to more than 100 global biomedical companies. Given its size, Singapore is undoubtedly a success story. Its top-ranked institution, NUS, ranks 16th in the

NATURE PUBLISHING INDEX SINGAPORE

2011				ASIA-PACIFIC	2010			2009			Total 2009-2011		
RANK	INSTITUTION	CORRECTED COUNT	ARTICLES	RANK	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	National University of Singapore (NUS)	6.28	32	16	2	3.76	23	2	2.46	9	2	12.50	64
2	Agency for Science, Technology and Research (A*STAR)	3.24	21	32	1	5.04	24	1	5.56	17	1	13.84	62
3	Nanyang Technological University (NTU)	3.03	10	33	3	1.64	5	3	1.40	5	3	6.07	20
4	DSO National Laboratories	0.38	2	156	–	–	–	–	–	–	5	0.38	2
5	Singapore Eye Research Institute	0.15	5	277	–	–	–	–	–	–	6	0.15	5
6	Laboratory of NF-κB Signaling	0.13	1	309	–	–	–	–	–	–	7	0.13	1
7	National Cancer Centre Singapore	0.10	2	343	8	0.01	1	–	–	–	9	0.11	3
8	Waseda Bioscience Research Institute in Singapore (WABIOS)	0.07	1	418	6	0.06	1	–	–	–	8	0.12	2
9	Singapore-MIT Alliance (SMA)	0.04	1	476	–	–	–	–	–	–	11	0.04	1
10	Merck Research Laboratories	0.02	1	543	–	–	–	–	–	–	12	0.03	1

Asia-Pacific region in 2011 and, at 110, just misses out on the Nature Publishing Index Global Top 100. The country has a vibrant knowledge-based economy, characterized by high levels of collaboration between government agencies and private research institutes, and also between disciplines. This multidisciplinary collaboration is actively encouraged in Singapore's R&D strategy, facilitated by the creation of research hubs in biomedical science (Biopolis) and, nearby, in physical sciences, IT and engineering (Fusionopolis). These hubs involve A*STAR institutes and research and development labs of international companies such as GlaxoSmithKline, Novartis and Merck.

Investment in science and technology is high and increasing — the Singapore government intends to spend 3.5% of GDP on research and development by 2015 and is already committed to outlaying US$16.1 billion for the period 2011–2015. With 53 articles in the Nature Publishing Index, Singaporean scientists have the distinction of being the most productive of the top five Asia-Pacific countries in terms of both articles per capita, and articles per research scientist. Singapore has by far the highest GDP per capita of the top five countries as well as the highest per capita expenditure on R&D.



NATURE PUBLICATIONS SINGAPORE

CHANGES AT THE TOP

This year marks a change in the rankings of Singapore institutions, with NUS taking over the top spot from A*STAR. The NUS, continuing its rise over the past few years, contributed to 32 articles published in Nature-branded primary research journals in 2011, up from 23 in 2010, while A*STAR dropped from 24 articles in 2010 to 21 in 2011.

The NUS, Singapore's largest university, is strongest in the life sciences, but also published three papers with high corrected counts in *Nature Photonics*, where it is the fourth-ranked institution in the region. It is home to Research Centres of Excellence (RCE) in quantum technologies, cancer science, and mechanobiology, as well as being a partner with Nanyang Technological University in an RCE in environmental life sciences engineering.

A*STAR has dropped from top-ten status in the Asia-Pacific over the past two years to 32nd in 2011. It is now only one rank in the Asia-Pacific listing above Singapore's third-ranked NTU. The majority of A*STAR's articles were published by the Genome Institute of Singapore, and the agency now ranks fourth in the Asia-Pacific region for *Nature Genetics*. In addition to its strength in life sciences, A*STAR institutes contributed to articles in high-performance computing, nanotechnology, optical physics and materials in Nature-branded primary research journals.

Nanyang Technological University (NTU), established in 1991 but already enrolling more than 33,000 students, is a founding member of the Global Alliance of Technological Universities — seven of the world's top technological universities that seek to develop scientific and technological solutions to global problems. The university has doubled its research staff in the past five years as it transforms from primarily a teaching role to a research-based institution. From 2010 to 2011, NTU doubled its paper count from five to ten, publishing articles in a range of fields including materials science, molecular and structural biology, photonics and geoscience.

Another significant facet of Singapore's success overall is the increase in the number of institutions contributing each year. Up from only the big three in 2009, ten institutions published in Nature-branded primary research journals in 2011. All except one of these other institutions ranked in the top 200 of the region in 2011. At present, they are publishing small numbers of articles with low corrected counts, but both the number of institutions included in the Index and the size of their contribution are expected to grow in coming years as Singapore's considerable investment in research and development bears fruit. ■

REGIONAL ROUNDUP

Researchers from a total of 17 countries and territories in the Asia-Pacific region published their work in Nature-branded primary research journals in 2011, an increase from 14 in 2010, including the addition of Myanmar and the re-emergence of Papua New Guinea, Vietnam and Malaysia — a strong indication that the region's smaller players are making a big impact in the international science arena.

2011 RANK	COUNTRY/TERRITORY	CORRECTED COUNT	ARTICLES
6	Taiwan	9.68	26
7	India	8.53	30
8	New Zealand	5.30	28
9	Indonesia	0.72	3
10	Vietnam	0.60	1
11	Thailand	0.50	5
12	Philippines	0.31	5
13	Malaysia	0.31	3
14	Bangladesh	0.31	2
15	Myanmar	0.25	1
16	Cambodia	0.07	1
16	Papua New Guinea	0.07	1

TAIWAN

Taiwan is the rising star of the Nature Publishing Index Asia-Pacific 2011, beating well-performed countries such as New Zealand and India. Ranked sixth, it registered a 65% increase in the number of articles published in Nature journals, rising from 17 articles in 2010, to 26 in 2011.

In addition to a dramatic rise in the number of articles contributed to the Nature Publishing Index, it is particularly notable that the corrected count for 2011 of 9.68 was much greater than the 2010 figure of 2.93 and 2.66 recorded in 2009.

Academia Sinica, the national academy of Taiwan, is the best performing institution outside the top five countries, and its progress illustrates Taiwan's sudden rise. The academy jumped 149 places in the Asia-Pacific rankings, from 179 in 2010 to 30 in 2011 and increased its publication count from two articles to ten. Academia Sinica published papers in Nature-branded primary research journals across a wide range of disciplines including genetics, physics and chemical biology, for which it was the highest ranked Asia-Pacific institution.

National Taiwan University, National Taipei University of Technology (NTUT) and National Chiao Tung University (NCTU) have also leapt into the Asia-Pacific top 100 — increasing their rankings to 78, 95 and 97 respectively.

INDIA

India improved its publication record after a slump in 2010. In 2011, by increasing its number of articles three-fold, India more than doubled its share of the index — from 1.4% of all 2010 articles to 3.0% of all 2011 articles. Ranked sixth in 2011, India comes in seventh spot when averaged over 2009–2011, just behind New Zealand and slightly ahead of Taiwan. In 2011, India had three institutions in the Asia-Pacific top 100 — the Tata Institute of Fundamental Research (TIFR) at 43, the Jawaharlal Nehru Centre for Advanced Scientific Research (81) and the Jawaharlal Nehru University (84).

The TIFR remained India's highest ranked institution. Its rank of 43 is a marked improvement from 137 in 2010 and 59 the year before that. Despite India's dramatic increase in article numbers from 2010 to 2011, however, the number from TIFR only increased from two to four. This was compensated by a jump in corrected count from 0.38 in 2010 to 2.5 in 2011. These articles were from a range of disciplines including genetics, materials science and cosmology.

Apart from the TIFR, no Indian institution published more than two articles in Nature-branded primary research journals. In summary, the rise in Indian publications in the Index was a result of an increase in the number of institutions contributing articles — up from 10 in 2010 to 38 in 2011.

NEW ZEALAND

In the past three years, New Zealand has been essentially deadlocked with India and Taiwan on corrected count and ranking. New Zealand holds down sixth place in the 2009–2011 aggregated corrected count with 16.65, just above Taiwan on 15.27 and India on 16.59. However, in the 2011 index, New Zealand dropped to eighth (from sixth in 2010), giving way to India and Taiwan, both of which have posted significant increases in corrected counts and raw number of articles.

New Zealand's article count barely changed between 2011 (28 articles) and 2010 (27), whilst its corrected count dropped to 5.3 from 7.3 over the same period. That said, there are New Zealand institutions with strong results. The University of Auckland lifted its Asia-Pacific ranking from 80 in 2010 to 46 in 2011 with a doubling of output from five articles in 2010 to 12 articles in 2011. New Zealand published mainly in the areas of genetics and evolution research. The nation's only other institution in the 2011 Asia-Pacific top 100 was the Victoria University of Wellington, lifting its ranking nine places to 91 in 2011. Missing from the 2011 Asia-Pacific Top 100 is New Zealand's oldest university, the University of Otago. It dropped to 132 from 25 in 2010. It had nine articles in 2010, including one in *Nature Physics*, while in 2011 there were only seven articles, mostly in molecular biology.

Entirely absent from the 2011 index is GNS Science, which consults and monitors geological hazards for the New Zealand Earthquake Commission and which published seven articles between 2009 and 2010 in *Nature* and *Nature Geoscience*. In view of the extreme seismic activity suffered by New Zealand in 2011, most notably the series of large earthquakes that struck the Christchurch region in February of that year, there may be a stronger showing in 2012 as those results are published.

OTHER COUNTRIES

The number of countries represented in the Asia-Pacific Nature Publishing Index increased from 14 in 2010, to 17 in 2011. Tonga did not appear in 2011, but Vietnam, Malaysia and Papua New Guinea are back after being absent in 2010.

Indonesia and Thailand continue to perform steadily at ranks nine and 11, respectively. Aggregated across 2009–2011, Indonesia has a corrected count of 1.43, with a total of seven articles over three years. Similarly, Thailand has an aggregated corrected count of 1.35 and a total of 18 articles over three years.

Bangladesh's ranking slipped from eighth to 14th, having been boosted by a highly scoring cell biology article in 2010. Myanmar made its debut in the Index at rank 15 with one article in *Nature Communications* on the genetics of the bumblebee bat. ■


National University of Singapore

A LEADER IN RESEARCH IN ASIA AND BEYOND

The National University of Singapore (NUS) is well-regarded as a leading, research-intensive institution. Since its inception in 1905 as a modest medical school, NUS has grown into a dynamic network for education, research and service. Members of its talented faculty are internationally renowned for their achievements in science, technology, humanities and, increasingly, multidisciplinary areas. The academic culture is both rigorous and innovative, producing excellence in education and high-impact research. NUS' world-class status is reflected in its consistently high performance in global university rankings.

NUS, an English-language university, takes an international approach to education and research, drawing on unique Asian perspectives and expertise. Its strength lies in addressing global issues relevant to Asia, such as the treatment of prevalent diseases, environmental sustainability and the region's rapid economic growth. A highly developed infrastructure and state-of-the art facilities help attract and retain top faculty and research partners, who undertake projects of the highest caliber and importance.

With 21 university-level research institutes and centers, as well as 16 faculties and schools, NUS has a broad and diverse research presence. Further raising the research profile of NUS are three Singapore Research Centres of Excellence (RCEs), specializing in quantum technologies, cancer and mechanobiology, respectively. A fourth RCE (a joint venture with Nanyang Technological University) focuses on environmental life sciences engineering. Whether conducted in a faculty-based program, a multidisciplinary center, or a national institute, research at NUS aspires to extend the frontiers of knowledge and contribute to real-world solutions.

Research highlights: scientific breakthroughs, practical applications, and new ventures

Research at NUS is diverse, collaborative and ground-breaking. Recent highlights include:

- distinguishing the genetic differences between two types of gastric cancer, paving the way for customized cancer treatment. An international team of scientists led by researchers at Duke-NUS Graduate Medical School Singapore (Duke-NUS) conducted this research.
- demonstrating that microscopy with helium ions may greatly enhance both surface and sub-cellular imaging, helping to further insights into cellular structure and function
- finding a chemical deterrent in spider silk that offers new prospects for pesticide design. This research was a collaboration with the University of Melbourne, Australia.
- discovering a cooling effect that could be harnessed to cool supercomputers that have their performance held back by heat generation. Physicists from the NUS Centre for Quantum Technologies, ETH Zurich Institute for Theoretical Physics and the University of Oxford, UK, collaborated on this research.

NUS research focuses on the development of practical research applications that benefit society. A low-cost cell phone application that identifies individuals through iris recognition, for example, will be used in healthcare settings to administer and track immunization programs. A novel energy-storage membrane developed at NUS could eventually power hybrid vehicles and store energy for solar panels. An energy-efficient air-conditioning system, another NUS project, allows for customization of ventilation and can lessen contaminants in indoor environments.

Continual investment by NUS in new facilities and ventures recently saw the official opening of the Saw Swee Hock School of Public Health. The Aquatic Science Centre @ Sungei Ulu Pandan was officially launched in July 2011 by the Singapore–Delft Water Alliance, a joint research initiative by NUS, PUB, Singapore's national water agency and the Dutch research institute Deltares. The X-ray Absorption Facility for Catalysis Research is now housed at NUS' Singapore Synchrotron Light Source. The university


also recently opened the NUS Centre for BioImaging Sciences to pioneer leading-edge development and application of novel imaging techniques and computational methods.

Recognizing that new breakthroughs are likely to result from cross-disciplinary initiatives, NUS has also begun to develop integrative research clusters on major themes: Finance and Risk Management, Biomedical Science and Translational Medicine, Ageing, Integrative Sustainability Solutions and Asian Studies. These clusters provide a novel infrastructure to foster synergy among specific knowledge domains, enabling researchers to tackle complex, multi-disciplinary issues.

Strategic partnerships: forming alliances at home and abroad

NUS has forged strong alliances in both the East and West. NUS President, Professor Tan Chorh Chuan, chairs the International Alliance of Research Universities, a select group of ten leading research universities from eight countries. NUS is also the first foreign university to establish a research institute in the Suzhou Industrial Park in China. The close proximity of NUS' main campus in Kent Ridge to several of Singapore's key science and technology hubs also offers opportunities for joint ventures that will produce highly skilled researchers and engineers.

NUS' new University Town is now home to the national-level Campus for Research, Technology and Enterprise (CREATE), an initiative of the National Research Foundation of Singapore. A collaboration bridging institutions, continents and disciplines, CREATE is a place where some of the leading universities work alongside NUS in areas that are aligned to Singapore's strategic interests. It opened with the Singapore-MIT Alliance for Research and Technology Centre, MIT's first international center of its kind. Other institutions to house research programs at CREATE include ETH Zurich, the University of California, Berkeley, the Technical University of Munich, the Hebrew University of Jerusalem, Ben-Gurion University, Shanghai Jiao Tong University, Technion-Israel Institute of Technology and Peking University.

A global university: influencing the future

With excellent resources and a supportive environment, NUS has drawn top researchers from the Asia-Pacific region and beyond. NUS has a joint recruitment scheme with Cambridge University, UK, which allows for the dual appointment of junior faculty in the areas of science and technology. To further cultivate research talent, NUS fosters a cross-disciplinary approach in its research and educational programs. For example, the NUS Graduate School for Integrative Sciences and Engineering encourages its students to transcend traditional discipline boundaries.

NUS offers more than 60 joint- and double-degree programs with leading universities throughout the world. Duke-NUS is now in Phase II of the partnership to provide medical education and conduct patient-oriented research. Singapore welcomed its first liberal arts college with the launch of Yale-NUS College, providing a new model of residential education in Asia. The NUS Overseas Colleges (NOC) program gives students the opportunity to complete internships in global entrepreneurial hubs; in 2011, the seventh NOC was established in Israel.

A global outlook impels NUS to seek solutions to real-world problems and strive for research excellence with wide-reaching significance. NUS takes an active stance in addressing critical challenges facing Asia and the world, and will continue to build and innovate across disciplines and cultures, transforming the present and influencing the future. ■

USING THE NATURE PUBLISHING INDEX

HOW TO FIND THE INFORMATION YOU NEED

www.natureasia.com/publishing-index

The Nature Publishing Index is maintained by Nature Publishing Group (NPG), a division of Macmillan Publishers that publishes *Nature*, the international science weekly, and over 30 Nature-branded primary research and review journals covering a broad spectrum of the life sciences, physical and chemical sciences, and clinical medicine. Nature journals are among the most highly cited journals in the scientific literature and are renowned for their publication of high-quality, high-impact research.

The index allows institutions and countries/territories to be ranked according to the number of primary research articles they publish in *Nature* and the 17 Nature research journals in a one-year period. The index presents both raw numbers of articles with author affiliations to a given country or institution, and a *corrected count* that is adjusted according to the relative contribution of each author to each published article based on the percentage of authors from that institution or country in the affiliations of the paper. This corrected count is tallied over a one-year period and used to rank the institutions and countries according to their contribution to Nature journals. Only articles printed in the ranking period are included in the calculation of the index — advance online publications are not included in the index until assigned an issue number and sent to press. The Nature Publishing Index 2011 Asia-Pacific is for the calendar year 2011: January 1 to December 31.

The index, online at **www.natureasia.com/publishing-index**, is updated every week with a moving window of one-year of data. The index website provides links to the abstracts of all articles used to calculate corrected counts, providing the details of individual papers and authors contributing to an institution or country's rank in the index and making the index fully transparent.

The index website also provides data for review articles published in Nature journals for the Asia-Pacific region. Review articles, however, are not included in the annual rankings because reviews are commissioned by Nature journal editors rather than being papers submitted by researchers.

NATURE PUBLISHING INDEX ASIA-PACIFIC

The Asia-Pacific index is updated weekly and includes articles published in the latest issues of the Nature journals. Users of the index website can subscribe for weekly email alerts to keep up to date with the latest results from the region. A print publication presenting the frozen data for each calendar year is published annually.

NATURE PUBLISHING INDEX GLOBAL TOP 50

The Global Top 100 is an index of the top 100 institutions based on publications in *Nature* and the Nature research journals. The index is updated annually and is currently in the beta stage of development as the algorithms that underlie the index calculations and determine affiliations undergo continued improvements for accuracy.

CORRECTED COUNT

The Nature Publishing Index is based on an article's *corrected count* — a calculation that takes into account the number of affiliated institutions per author and the percentage of authors per institution. All authors are considered to have contributed equally to each article. The maximum corrected count for any article is 1.0. The corrected count for a country/territory reflects the total corrected count for all institutions based in that region. The rules governing the calculation of corrected counts with respect to the way affiliations are presented are adjusted regularly to account for new scenarios.

The Nature Publishing Index is based on affiliation data drawn from Nature journal articles published on nature.com. There is great variability in the way authors present their affiliations. Every effort is made to count affiliations in a consistent way making reasonable assumptions to determine corrected counts and these assumptions are explained on the index website. As such, the corrected counts are approximations based on these assumptions and no counts are definitive.

RANKINGS, GRAPHS AND LISTS

COUNTRY RANKINGS

Countries and territories are ranked according to corrected count and can also be filtered by article type using the selector at the top of the page. Clicking on a country name will display a list of institutions within that country/territory.

INSTITUTION RANKINGS

The institutional rankings track institutions in the Asia-Pacific region (including India and Australasia) according to corrected count. Data for primary research articles (Articles, Letters and Brief Communications), reviews, or a combination of both, can be viewed by selecting the appropriate tab in the article filter at the top of the page.

By default, the top 25 institutions are listed; clicking on 'Show all' at the bottom of the list will display all of the institutions. Clicking on the number in the 'Articles' column displays a list of all the articles from that particular institution.

Global institutional rankings are also available under the Global Top 100 website. The global index page shows the list of institutions ranked by corrected count, and the list of Nature articles contributing to the corrected count can be accessed by clicking on the number in the 'Articles' column.

RANKINGS BY NATURE JOURNAL

The journal rankings group all articles from the Asia-Pacific region according to their Nature research journal, and can be filtered by article type. By default, the top five institutions are listed for each journal. Clicking on 'Show All' lists all of the institutions from the Asia-Pacific that have affiliations listed in that journal, and clicking on the number of articles displays a list of the articles from that journal with affiliations from that institution.

HISTORICAL RANKINGS

The historical rankings track data by Asia-Pacific country for primary research articles (reviews are not included) back to 2000. Clicking on the year at the top of the table will display the rankings for that year based on the corrected count.

HISTORICAL GRAPHS

These graphs provide a visual representation of the historical data based on primary research articles only. By default, the top five countries are displayed but users can freely select or deselect the countries of their choice. The graph is redrawn after a change in selection. By default, data for the corrected count is displayed; however, data for the number of articles can also be selected. Clicking on 'Show Data' will display the numerical values (rounded to the closest whole number) along the line graph.

LATEST RESEARCH

The latest research section provides a breakdown of the latest publications in Nature journals from the Asia-Pacific region by country/territory, including journal name and article title.

HOW TO READ THE INDEX

ARTICLE FILTER

The index primarily tracks research articles, but data on reviews is also available. At the top of most ranking lists there is an article filter. Since the index focuses on primary research articles, the tab for 'Research Articles' is selected by default. However, clicking on 'Reviews' displays data for review articles, while clicking on 'All' displays both primary research articles and reviews.

Research Articles | Reviews | All

Institution	Corrected Count[2]	Articles[3]
1. The University of Tokyo, Japan	41.42	103
2. ⊞Chinese Academy of Sciences (CAS), China	23.34	64
3. Kyoto University, Japan	22.34	54
4. RIKEN, Japan	20.29	71
5. Osaka University, Japan	19.17	54

Research Articles | **Reviews** | All

Institution	Corrected Count[3]	Articles[4]
1. The University of Tokyo, Japan	4.05	6
2. The University of Sydney, Australia	4.00	5
3. Monash University, Australia	3.50	7
4. The University of Melbourne, Australia	3.33	8
5. The University of New South Wales, Australia	3.15	7

Research Articles | Reviews | **All**

Institution	Corrected Count[3]	Articles[4]
1. The University of Tokyo, Japan	45.47	109
2. ⊞Chinese Academy of Sciences (CAS), China	23.67	65
3. Kyoto University, Japan	23.34	55
4. RIKEN, Japan	23.20	76
5. Osaka University, Japan	19.77	54

EXPANDED AFFILIATIONS

Certain organizations, such as the Chinese Academy of Sciences and the Agency for Science, Technology and Research are umbrella agencies with many affiliated institutions. Such organizations are indicated by a plus mark ('+') in the index lists and can be expanded to show the contribution from each constituent institution.

Research Articles | Reviews | **All**

Institution	Corrected Count[3]	Articles[4]
1. The University of Tokyo, Japan	45.47	109
2. ⊟Chinese Academy of Sciences (CAS), China	23.67	65
... Shanghai Institutes for Biological Sciences (SIBS), CAS	4.16	14
... Institute of Physics (IOP), CAS	3.58	11
... Institute of Botany (IOB), CAS	2.53	6
... Institute of Biophysics (IBP), CAS	2.41	5
... Institute of Vertebrate Paleontology and Paleoanthropology (IVPP), CAS	1.51	3

ARTICLES

The number of articles reflects the total number of articles with author affiliations for a particular institution or country. Institutions and countries are counted once per article. Clicking on the number of articles in any of the index ranking lists brings up a list of all of the articles published by an institution or country/territory in the past year. The articles contributing to the index are listed along with the name of the Nature journal and the corrected count associated with that article. Hovering over the article title reveals the article DOI and clicking on the title opens the article abstract on **nature.com**.

Research Articles | Reviews | All

Journal	Title	CC[2]
Nature Communications	evidence for synchronicity between a rise in atmospheric and Palaeoproterozoic deglaciation	0.45
Nature	imaging of T cells providing immune privilege to the haematopoietic stem-cell niche	0.13

TOP 200 INSTITUTIONS

ASIA-PACIFIC 2011

The complete list of institutions and universities appearing in the Nature Publishing Index from the Asia-Pacific region in 2011 runs to almost 600 contributors — an increase of 42% on the previous year — from 17 countries in the region. Below we present the article and corrected count data for the top 200 universities and institutions in 2011, along with corresponding data for 2010 and 2009 and combined scores for the three years 2009–2011. These data incorporate contributions from Brief Communications for all three years, something which was not the case in previous editions of this report. We hope that the inclusion of this new information, as well as historical and three-year aggregated data will give our readers a more detailed insight into the developing dynamic and long-term trends in the index.

NATURE PUBLISHING INDEX 2011 ASIA-PACIFIC — INSTITUTIONS

2011					2010			2009			Total 2009-2011		
RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	42.88	109	1	36.51	84	1	29.47	70	1	108.87	263
2	Kyoto University	Japan	23.98	56	3	16.97	35	2	19.57	44	2	60.52	135
3	Chinese Academy of Sciences (CAS)	China	22.43	62	5	13.17	40	5	12.01	31	5	47.61	133
4	RIKEN	Japan	19.96	70	2	19.76	53	4	12.56	42	3	52.28	165
5	Osaka University	Japan	17.31	48	4	13.33	35	3	17.04	37	4	47.68	120
6	Seoul National University	Korea	11.27	32	10	4.99	18	7	5.95	13	7	22.21	63
7	Tohoku University	Japan	11.01	29	6	8.03	22	6	7.08	23	6	26.12	74
8	The University of Melbourne	Australia	9.83	46	27	2.60	17	12	4.26	23	9	16.69	86
9	Nagoya University	Japan	9.67	26	8	5.44	14	9	4.86	13	8	19.97	53
10	National Institute of Advanced Industrial Science and Technology (AIST)	Japan	9.03	22	12	4.54	18	28	2.09	9	12	15.66	49
11	University of Science and Technology of China	China	8.58	17	16	3.83	8	20	2.67	8	13	15.08	33
12	The University of Queensland	Australia	7.70	34	14	4.38	16	11	4.35	18	10	16.44	68
13	Peking University	China	7.24	21	19	3.46	17	19	2.82	9	16	13.51	47
14	Australian National University	Australia	7.18	13	31	2.17	10	10	4.65	15	14	14.01	38
15	Tsinghua University	China	6.36	16	7	6.15	16	16	3.32	9	11	15.83	41
16	National University of Singapore	Singapore	6.28	32	17	3.76	23	22	2.46	9	18	12.50	64
17	Monash University	Australia	5.24	17	20	3.24	10	18	3.05	10	19	11.53	37
18	The University of Sydney	Australia	5.00	30	13	4.40	23	17	3.13	9	17	12.54	62
19	Kyushu University	Japan	4.58	19	29	2.35	10	14	3.60	12	21	10.53	41
20	National Institute for Material Science (NIMS)	Japan	4.52	12	33	2.08	7	26	2.31	5	24	8.90	24
21	Hokkaido University	Japan	4.26	16	15	4.05	8	31	1.67	5	22	9.97	29
22	The University of Western Australia	Australia	4.08	22	114	0.49	15	36	1.41	11	37	5.98	48
23	Hong Kong University of Science and Technology (HKUST)	China	3.86	5	37	1.86	3	–	–	–	39	5.72	8
24	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Australia	3.81	14	26	2.62	11	49	1.12	6	27	7.55	31
25	Xiamen University	China	3.77	6	39	1.83	3	59	1.00	1	32	6.59	10
26	Korea Advanced Institute of Science & Technology (KAIST)	Korea	3.74	13	11	4.62	11	23	2.43	4	20	10.79	28
27	Pohang University of Science and Technology (POSTECH)	Korea	3.73	8	40	1.82	6	29	2.01	8	26	7.56	22
28	Shanghai Jiao Tong University (SJTU)	China	3.73	21	69	0.99	4	30	1.76	10	33	6.48	35
29	The University of Hong Kong	China	3.58	12	32	2.17	8	38	1.36	5	28	7.10	25
30	Academia Sinica	Taiwan	3.52	10	179	0.24	2	51	1.08	3	44	4.84	15
31	Tokyo Institute of Technology	Japan	3.46	14	35	2.04	9	33	1.50	11	30	7.00	34
32	Agency for Science, Technology and Research (A*STAR)	Singapore	3.24	21	9	5.04	24	8	5.56	17	15	13.84	62
33	Nanyang Technological University	Singapore	3.03	10	46	1.64	5	37	1.40	5	35	6.07	20
34	The University of New South Wales	Australia	3.02	16	24	2.80	15	52	1.08	5	31	6.90	36
35	Nanjing University	China	3.01	11	22	3.16	8	35	1.41	5	25	7.58	24
36	Beijing Genomics Institute (BGI), Shenzhen	China	2.97	11	18	3.59	9	103	0.52	1	29	7.08	21
37	Zhejiang University	China	2.96	8	48	1.58	12	85	0.66	4	41	5.20	24
38	National Institute of Biological Sciences, Beijing (NIBS, Beijing)	China	2.91	7	62	1.04	2	118	0.44	1	49	4.39	10
39	Samsung	Korea	2.86	5	181	0.23	2	21	2.48	5	40	5.57	12
40	Keio University	Japan	2.73	9	21	3.23	7	13	3.74	11	23	9.69	27
41	Korea University	Korea	2.71	12	47	1.58	5	27	2.15	8	34	6.44	25
42	NTT Group	Japan	2.61	7	50	1.50	2	–	–	–	50	4.11	9

2011					2010			2009			Total 2009-2011		
RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
43	Tata Institute of Fundamental Research (TIFR)	India	2.50	4	137	0.38	2	59	1.00	1	51	3.88	7
44	National Institutes of Natural Sciences (NINS)	Japan	2.47	4	122	0.46	3	–	–	–	67	2.93	7
45	Fudan University	China	2.34	14	51	1.43	9	64	0.93	6	46	4.71	29
46	The University of Auckland	New Zealand	2.25	12	80	0.80	5	128	0.37	3	58	3.42	20
47	Waseda University	Japan	2.18	6	72	0.87	5	102	0.53	3	53	3.58	14
48	Yokohama City University	Japan	1.90	8	90	0.69	4	76	0.76	5	59	3.35	17
49	The Graduate University for Advanced Studies (Sokendai)	Japan	1.88	9	268	0.09	2	115	0.48	4	70	2.46	15
50	National Center of Biomedical Analysis	China	1.82	2	–	–	–	–	–	–	90	1.82	2
51	Queensland Institute of Medical Research (QIMR)	Australia	1.79	15	77	0.83	16	24	2.42	12	43	5.04	43
52	Tokyo Medical and Dental University	Japan	1.77	10	38	1.86	6	25	2.39	13	36	6.02	29
53	Ewha Womans University	Korea	1.75	8	107	0.53	3	42	1.24	2	55	3.52	13
54	Second Military Medical University	China	1.65	6	41	1.78	3	55	1.04	3	48	4.47	12
55	University of Tsukuba	Japan	1.57	9	44	1.69	4	32	1.56	7	45	4.82	20
56	Chinese Academy of Medical Sciences & Peking Union Medical College	China	1.47	14	204	0.19	4	183	0.19	1	87	1.85	19
57	Hiroshima University	Japan	1.46	7	36	1.99	6	43	1.22	9	47	4.67	22
58	Kobe University	Japan	1.45	5	71	0.91	7	45	1.18	7	54	3.54	19
59	Hanyang University	Korea	1.44	6	74	0.85	2	86	0.66	2	65	2.95	10
60	Chiba University	Japan	1.42	6	163	0.28	3	44	1.19	3	68	2.89	12
61	Nara Institute of Science and Technology (NAIST)	Japan	1.42	4	42	1.75	6	245	0.10	1	61	3.27	11
62	Tokyo University of Science	Japan	1.38	5	239	0.13	1	400	0.02	1	105	1.53	7
63	Sungkyunkwan University	Korea	1.36	4	23	2.87	6	65	0.93	4	42	5.16	14
64	Wuhan University of Technology	China	1.27	2	–	–	–	–	–	–	124	1.27	2
65	James Cook University	Australia	1.26	7	302	0.07	2	351	0.04	1	115	1.37	10
66	The Chinese University of Hong Kong	China	1.25	2	88	0.71	5	58	1.02	4	64	2.98	11
67	Japan Synchrotron Radiation Research Institute (JASRI)	Japan	1.24	5	57	1.24	8	231	0.13	1	69	2.61	14
68	Ishikawa Prefectural University	Japan	1.24	3	161	0.29	1	–	–	–	106	1.53	4
69	Jilin University	China	1.24	3	251	0.11	2	127	0.37	4	98	1.73	9
70	Chinese Academy of Geological Sciences (CAGS)	China	1.20	3	111	0.50	2	150	0.25	1	83	1.95	6
71	Yonsei University	Korea	1.20	6	104	0.55	6	41	1.27	3	63	3.02	15
72	Huazhong Agricultural University	China	1.20	4	357	0.03	1	–	–	–	129	1.23	5
73	Nanjing Medical University	China	1.18	5	61	1.07	3	–	–	–	74	2.24	8
74	Macquarie University	Australia	1.17	9	49	1.52	4	130	0.35	3	62	3.03	16
75	National Center for Neurology and Psychiatry (NCNP)	Japan	1.13	3	126	0.43	3	315	0.05	1	102	1.61	7
76	Japan Atomic Energy Agency (JAEA)	Japan	1.12	6	105	0.55	2	245	0.10	1	93	1.77	9
77	Xi'an Jiaotong University	China	1.12	4	82	0.80	2	–	–	–	85	1.92	6
78	National Taiwan University	Taiwan	1.10	7	280	0.08	1	92	0.57	2	95	1.76	10
79	Japan Agency for Marine-Earth Science and Technology (JAMSTEC)	Japan	1.04	7	30	2.27	6	186	0.17	2	57	3.48	15
80	Nankai University	China	1.03	2	58	1.24	4	210	0.14	1	72	2.41	7
81	Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)	India	1.02	2	–	–	–	330	0.04	1	141	1.06	3
82	Okinawa Institute of Science and Technology (OIST)	Japan	1.01	2	63	1.04	3	–	–	–	81	2.05	5
83	Huazhong University of Science and Technology (HUST)	China	1.00	6	–	–	–	132	0.35	2	116	1.35	8
84	Toyama Prefectural University	Japan	1.00	1	196	0.20	1	–	–	–	130	1.20	2
84	Geospatial Information Authority of Japan (GSI)	Japan	1.00	1	–	–	–	–	–	–	147	1.00	1
84	Jawaharlal Nehru University	India	1.00	1	–	–	–	–	–	–	147	1.00	1
87	National Institute for Environmental Studies (NIES)	Japan	0.98	4	166	0.27	1	137	0.33	2	104	1.59	7
88	University of Tasmania	Australia	0.95	7	78	0.82	5	125	0.38	5	79	2.15	17
89	Osaka City University	Japan	0.94	3	162	0.29	1	46	1.18	5	71	2.41	9
89	JEOL Ltd.	Japan	0.94	3	–	–	–	94	0.56	2	107	1.50	5
91	Victoria University of Wellington	New Zealand	0.94	4	100	0.62	4	238	0.12	1	99	1.68	9
92	Tokyo Metropolitan Institute of Medical Science	Japan	0.94	3	142	0.36	2	87	0.64	5	84	1.94	10
93	NEC Corporation	Japan	0.88	4	354	0.04	1	–	–	–	161	0.92	5
94	Southwest University	China	0.87	1	224	0.15	1	–	–	–	144	1.02	2
95	National Taipei University of Technology (NTUT)	Taiwan	0.86	1	–	–	–	–	–	–	164	0.86	1

2011					2010			2009			Total 2009-2011		
RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
96	The University of Adelaide	Australia	0.85	12	79	0.81	7	268	0.08	3	97	1.74	22
97	National Chiao Tung University (NCTU)	Taiwan	0.83	5	280	0.08	1	223	0.13	3	142	1.04	9
98	The Walter and Eliza Hall Institute of Medical Research (WEHI)	Australia	0.78	7	45	1.65	7	15	3.33	9	38	5.76	23
99	Ajou University	Korea	0.78	2	118	0.48	3	356	0.03	1	121	1.29	6
100	La Trobe University	Australia	0.77	3	–	–	–	186	0.17	1	160	0.94	4
101	Griffith University	Australia	0.76	4	43	1.70	6	73	0.81	6	60	3.27	16
102	High Energy Accelerator Research Organization (KEK)	Japan	0.74	6	228	0.14	1	–	–	–	163	0.89	7
103	SA Health	Australia	0.74	3	180	0.23	3	–	–	–	155	0.97	6
104	National Astronomical Observatory of Japan (NAOJ)	Japan	0.73	3	270	0.09	1	106	0.51	3	118	1.34	7
105	Anhui Medical University	China	0.73	4	53	1.36	3	34	1.42	3	56	3.51	10
106	Chungnam National University (CNU)	Korea	0.73	2	324	0.05	1	163	0.23	2	145	1.01	5
107	The University of Newcastle	Australia	0.72	4	–	–	–	129	0.37	4	139	1.09	8
108	The Centre for DNA Fingerprinting and Diagnostics (CDFD)	India	0.71	2	–	–	–	–	–	–	186	0.71	2
109	China Medical University	Taiwan	0.71	5	136	0.39	3	352	0.03	2	132	1.14	10
110	Curtin University	Australia	0.70	4	303	0.07	2	67	0.89	3	100	1.66	9
111	University of Shanghai for Science and Technology	China	0.68	1	–	–	–	–	–	–	190	0.68	1
112	Nagasaki University	Japan	0.68	4	120	0.47	3	261	0.09	1	128	1.24	8
113	National Institute of Health	Korea	0.68	3	375	0.02	2	91	0.58	1	123	1.28	6
114	Shandong University	China	0.67	6	97	0.63	4	245	0.10	1	113	1.40	11
115	Japan Advanced Institute of Science and Technology (JAIST)	Japan	0.67	1	280	0.08	1	–	–	–	178	0.75	2
115	Ocean University of China	China	0.67	2	–	–	–	–	–	–	193	0.67	2
117	JT Biohistory Research Hall (BRH)	Japan	0.67	2	–	–	–	–	–	–	194	0.67	2
118	National Institute of Informatics (NII)	Japan	0.64	5	81	0.80	2	–	–	–	111	1.44	7
119	Northwest University	China	0.64	2	–	–	–	–	–	–	202	0.64	2
120	National Cancer Center	Japan	0.63	2	129	0.42	1	70	0.85	3	86	1.90	6
121	Victor Chang Cardiac Research Institute (VCCRI)	Australia	0.63	2	52	1.43	3	345	0.04	1	80	2.09	6
121	Tokyo Metropolitan Instituite for Neuroscience	Japan	0.63	1	95	0.63	1	109	0.50	1	94	1.76	3
123	Chinese Academy of Agricultural Sciences (CAAS)	China	0.62	4	98	0.63	4	130	0.35	2	103	1.60	10
124	Okayama University	Japan	0.61	3	59	1.12	3	161	0.24	2	82	1.96	8
125	Chung-Ang University (CAU)	Korea	0.61	2	–	–	–	165	0.22	1	167	0.83	3
126	Australian Institute of Marine Science	Australia	0.60	1	–	–	–	–	–	–	211	0.60	1
127	Fujian Medical University	China	0.58	2	405	0.01	1	–	–	–	213	0.59	3
128	International Centre for Genetic Engineering and Biotechnology (ICGEB)	India	0.57	1	–	–	–	191	0.17	1	183	0.74	2
129	Osaka Bioscience Institute	Japan	0.56	1	257	0.10	1	–	–	–	195	0.66	2
130	National Institute for Basic Biology (NIBB)	Japan	0.56	3	178	0.24	2	–	–	–	170	0.80	5
131	Sun Yat-Sen University	China	0.55	7	91	0.67	7	310	0.06	1	122	1.28	15
132	The University of Otago	New Zealand	0.54	7	25	2.75	9	93	0.57	6	52	3.86	22
133	Toyota Motor Corporation	Japan	0.53	2	–	–	–	–	–	–	233	0.53	2
134	National Synchrotron Radiation Research Center	Taiwan	0.52	3	–	–	–	–	–	–	239	0.52	3
135	National Institute of Biomedical Innovation (NIBIO)	Japan	0.51	3	–	–	–	–	–	–	243	0.51	3
136	Gwangju Institute of Science and Technology (GIST)	Korea	0.50	2	94	0.65	2	50	1.08	3	76	2.23	7
136	Beihang University (BUAA)	China	0.50	1	172	0.25	1	–	–	–	178	0.75	2
136	Ibaraki University	Japan	0.50	1	228	0.14	1	–	–	–	203	0.64	2
136	South Australian Museum	Australia	0.50	2	–	–	–	–	–	–	245	0.50	2
140	Flinders University	Australia	0.49	3	325	0.05	1	344	0.04	2	219	0.58	6
141	Konkuk University	Korea	0.49	2	182	0.23	3	241	0.11	1	168	0.82	6
142	Swinburne University of Technology	Australia	0.47	3	144	0.35	2	59	1.00	1	89	1.82	6
143	Hitachi, Ltd.	Japan	0.46	1	159	0.29	2	54	1.05	3	92	1.79	6
143	City University of Hong Kong	China	0.46	2	–	–	–	–	–	–	259	0.46	2
145	National Institute for Physiological Sciences (NIPS)	Japan	0.45	3	294	0.08	2	231	0.13	1	197	0.66	6
146	National Health Research Institutes (NHRI)	Taiwan	0.45	1	–	–	–	–	–	–	262	0.45	1
147	Panasonic Corporation	Japan	0.44	2	–	–	–	–	–	–	264	0.44	2
148	China University of Geosciences	China	0.43	4	–	–	–	185	0.17	3	209	0.61	7

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RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES	RANK	CORRECTED COUNT	ARTICLES
149	Korea Research Institute of Bioscience and Biotechnology (KRIBB)	Korea	0.43	3	83	0.76	3	117	0.44	1	101	1.63	7
150	International Superconductivity Technology Center (ISTEC)	Japan	0.43	1	–	–	–	–	–	–	269	0.43	1
151	The Royal Children's Hospital Melbourne (RCH)	Australia	0.42	2	247	0.12	1	423	0.00	1	229	0.54	4
152	Kyungpook National University	Korea	0.42	2	–	–	–	–	–	–	273	0.42	2
153	China Earthquake Administration	China	0.41	2	151	0.32	2	101	0.53	1	126	1.26	5
154	Shanghai Normal University (SHNU)	China	0.40	1	–	–	–	–	–	–	279	0.40	1
155	Korea Basic Science Institute (KBSI)	Korea	0.39	3	235	0.13	1	39	1.29	5	91	1.81	9
156	DSO National Laboratories	Singapore	0.38	2	–	–	–	–	–	–	286	0.38	2
157	Central South University (CSU)	China	0.37	4	–	–	–	236	0.12	2	250	0.49	6
158	National Center for Nanoscience and Technology (NCNST)	China	0.37	2	239	0.13	1	–	–	–	251	0.49	3
159	Soochow University	China	0.35	5	158	0.29	2	201	0.15	2	173	0.79	9
160	Australian Astronomical Observatory	Australia	0.35	1	191	0.22	1	–	–	–	223	0.57	2
161	University of Miyazaki	Japan	0.35	2	–	–	–	63	0.96	2	120	1.31	4
162	University of New England	Australia	0.33	2	–	–	–	–	–	–	300	0.33	2
163	Shenyang Normal University	China	0.33	1	–	–	–	88	0.63	1	156	0.96	2
163	Indian Institute of Science Education and Research (IISER)	India	0.33	1	290	0.08	1	–	–	–	277	0.41	2
163	Center for International Forestry Research (CIFOR)	Indonesia	0.33	1	–	–	–	–	–	–	301	0.33	1
163	East China University of Science and Technology (ECUST))	China	0.33	1	–	–	–	–	–	–	301	0.33	1
163	National Institute of Animal Health	Japan	0.33	1	–	–	–	–	–	–	301	0.33	1
168	CHA University	Korea	0.33	3	354	0.04	1	–	–	–	292	0.36	4
169	Korea Institute of Science and Technology (KIST)	Korea	0.32	3	86	0.74	4	47	1.15	2	77	2.21	9
170	National Institute of Water and Atmospheric Research (NIWA)	New Zealand	0.32	1	196	0.20	1	–	–	–	240	0.52	2
170	Sun Moon University	Korea	0.32	1	–	–	–	191	0.17	1	253	0.48	2
172	Fisheries Research Agency	Japan	0.32	1	–	–	–	–	–	–	315	0.32	1
173	National Tsing Hua University	Taiwan	0.31	2	205	0.19	2	–	–	–	248	0.50	4
174	Korea Ocean Research & Development Institute (KORDI)	Korea	0.30	1	145	0.35	1	138	0.33	1	154	0.98	3
174	Japan Biological Informatics Consortium (JBIC)	Japan	0.30	1	–	–	–	245	0.10	1	279	0.40	2
174	Electronics and Telecommunications Research Institute (ETRI)	Korea	0.30	1	–	–	–	–	–	–	316	0.30	1
174	Hankuk University of Foreign Studies (HUFS)	Korea	0.30	1	–	–	–	–	–	–	316	0.30	1
174	Tokyo Gakugei University	Japan	0.30	1	–	–	–	–	–	–	316	0.30	1
179	Shandong Provincial Institute of Dermatology and Venereology	China	0.30	1	373	0.02	1	403	0.01	1	298	0.33	3
180	National Yang-Ming University (NYMU)	Taiwan	0.29	3	102	0.56	2	245	0.10	1	157	0.95	6
180	Mitsubishi Chemical Corporation	Japan	0.29	2	–	–	–	109	0.50	1	171	0.79	3
180	National Institute of Health Sciences (NIHS)	Japan	0.29	2	–	–	–	–	–	–	321	0.29	2
183	Fukushima Medical University	Japan	0.29	2	326	0.05	1	264	0.09	1	268	0.43	4
184	Chiba Institute of Technology	Japan	0.29	2	–	–	–	300	0.06	1	295	0.35	3
185	Shandong Provincial Key Lab for Dermatovenereology	China	0.29	1	–	–	–	–	–	–	324	0.29	1
186	Beijing Normal University	China	0.29	4	146	0.35	2	356	0.03	1	192	0.67	7
187	Shantou University	China	0.29	2	339	0.04	2	–	–	–	310	0.33	4
188	Korea Research Institute of Chemical Technology (KRICT)	Korea	0.29	1	89	0.71	2	–	–	–	152	0.99	3
188	Aoyama Gakuin University	Japan	0.29	1	–	–	–	169	0.22	2	244	0.50	3
188	Canon ANELVA Corporation	Japan	0.29	1	–	–	–	–	–	–	326	0.29	1
188	Dr. Shroff's Charity Eye Hospital	India	0.29	1	–	–	–	–	–	–	326	0.29	1
188	National Agriculture Research Center for Hokkaido Region	Japan	0.29	1	–	–	–	–	–	–	326	0.29	1
193	Korea Research Institute of Standards and Science (KRISS)	Korea	0.28	2	–	–	–	–	–	–	333	0.28	2
194	Kyung Hee University	Korea	0.28	4	–	–	–	77	0.74	3	143	1.02	7
195	Rigaku Corporation	Japan	0.28	2	–	–	–	–	–	–	335	0.28	2
196	Chang Gung University	Taiwan	0.27	4	155	0.31	2	295	0.07	2	200	0.65	8
197	Kitasato University	Japan	0.27	3	–	–	–	169	0.22	2	252	0.49	5
198	Tokyo University of Agriculture	Japan	0.27	1	186	0.22	1	–	–	–	249	0.49	2
199	Hamamatsu University	Japan	0.27	3	–	–	–	109	0.50	1	175	0.77	4
200	National Institute of Agrobiological Sciences (NIAS)	Japan	0.27	1	75	0.85	3	–	–	–	134	1.12	4

TOP INSTITUTIONS BY NATURE JOURNAL

ASIA-PACIFIC 2009–2011

The flagship journal *Nature* — which celebrated its 142nd anniversary in 2011 — is the mother of a growing family of Nature Publishing Group (NPG) journals. Recently that family welcomed its latest addition in the shape of *Nature Climate Change* which was launched in April 2011. Along with *Nature Communications*, launched in 2010 as the first interdisciplinary journal from NPG since *Nature* itself, this brings the total number of primary research journals included in the Nature Publishing Index to eighteen. Whilst *Nature* and *Nature Communications* are published every week, the Nature research journals, covering a wide range of disciplines in the life, physical and chemical sciences, are published monthly. The top five Asia-Pacific institutions publishing in *Nature* and the Nature research titles **calculated from an aggregate of the past three years of data covering the period (2009–2011)** are presented below.

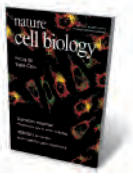
NATURE

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	26.90	68
2	Kyoto University	Japan	13.59	34
3	Chinese Academy of Sciences (CAS)	China	13.56	55
4	Osaka University	Japan	11.39	30
5	RIKEN	Japan	11.14	43

NATURE BIOTECHNOLOGY

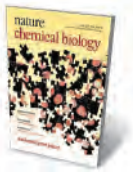
Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	Beijing Genomics Institute (BGI)	China	1.74	4
2	RIKEN	Japan	1.59	3
3	The University of Sydney	Australia	1.53	2
4	Southwest University	China	1.02	2
5	Chugai Pharmaceutical	Japan	1.00	1

NATURE CELL BIOLOGY



Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	Osaka University	Japan	5.76	12
2	The University of Tokyo	Japan	4.25	7
3	RIKEN	Japan	3.82	9
4	Agency for Science, Technology and Research (A*STAR)	Singapore	2.04	6
5	Peking University	China	1.99	3

NATURE CHEMICAL BIOLOGY



Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	5.76	9
2	RIKEN	Japan	3.63	8
3	Kyoto University	Japan	2.54	6
4	Nagoya University	Japan	1.68	2
5	Osaka University	Japan	1.63	2

NATURE CHEMISTRY

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	11.56	15
2	Kyoto University	Japan	4.28	7
3	Osaka University	Japan	3.68	6
4	Nagoya University	Japan	2.32	3
5	Nankai University	China	2.00	2

NATURE CLIMATE CHANGE

Total 2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The Commonwealth Scientific and Industrial Research Organisation (CSIRO)	Australia	0.88	3
2	The University of New South Wales	Australia	0.71	2
3	The University of Queensland	Australia	0.62	2
4	Australian Institute of Marine Science	Australia	0.60	1
5	University of Tasmania	Australia	0.50	1

NATURE COMMUNICATIONS

Total 2010–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	Kyoto University	Japan	11.38	21
2	The University of Tokyo	Japan	10.77	28
3	Chinese Academy of Sciences (CAS)	China	7.96	21
4	Osaka University	Japan	6.35	13
5	Nagoya University	Japan	6.22	12

NATURE GENETICS

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	RIKEN	Japan	9.89	26
2	The University of Tokyo	Japan	4.51	27
3	Anhui Medical University	China	3.51	10
4	Chinese Academy of Sciences (CAS)	China	3.42	19
5	Queensland Institute of Medical Research	Australia	3.28	32

NATURE GEOSCIENCE

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	3.66	11
2	Kyoto University	Japan	3.33	4
3	The University of Sydney	Australia	2.20	5
4	Japan Agency for Marine-Earth Science and Technology	Japan	1.79	6
5	Australian National University	Australia	1.77	6

NATURE IMMUNOLOGY

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	Second Military Medical University	China	3.90	5
2	RIKEN	Japan	3.55	12
3	Osaka University	Japan	3.47	9
4	The University of Melbourne	Australia	3.17	6
5	Chinese Academy of Sciences (CAS)	China	2.72	6

NATURE MATERIALS

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	10.34	22
2	Tohoku University	Japan	7.59	17
3	Kyoto University	Japan	5.45	11
4	Seoul National University	Korea	2.84	4
5	National Institute for Materials Science (NIMS)	Japan	2.43	7

NATURE MEDICINE

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	4.29	13
2	Kyoto University	Japan	2.95	6
3	Tokyo Medical and Dental University	Japan	1.22	5
4	Chinese Academy of Sciences (CAS)	China	1.18	3
5	Osaka University	Japan	1.15	8

NATURE METHODS

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	RIKEN	Japan	2.04	4
2	Osaka University	Japan	1.91	4
3	Monash University	Japan	1.49	2
4	Hokkaido University	Japan	1.27	2
5	Hitachi, Ltd.	Japan	1.00	1

NATURE NANOTECHNOLOGY

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	4.19	6
2	Osaka University	Japan	3.00	4
3	Pohang University of Science and Technology	Korea	2.76	6
4	National Institute of Advanced Industrial Science and Technology	Japan	2.42	5
5	Nanjing University	China	2.19	4

NATURE NEUROSCIENCE

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	Kyoto University	Japan	3.89	11
2	RIKEN	Japan	3.09	7
3	The University of Tokyo	Japan	2.82	7
4	Chinese Academy of Sciences	China	2.66	6
5	Hong Kong University of Science and Technology	China	2.00	2

NATURE PHOTONICS

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	University of Science and Technology of China	China	3.65	6
2	Samsung	Korea	2.67	3
3	The University of Tokyo	Japan	2.63	5
4	Korea Advanced Institute of Science and Technology (KAIST)	Korea	1.88	3
5	Seoul National University	Korea	1.62	4

NATURE PHYSICS

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	8.03	18
2	Chinese Academy of Sciences (CAS)	China	3.95	14
3	Tohoku University	Japan	3.59	9
4	Kyoto University	Japan	3.58	6
5	University of Science and Technology of China	China	2.83	6

NATURE STRUCTURAL & MOLECULAR BIOLOGY

Total 2009–2011 RANK	INSTITUTION	COUNTRY/ TERRITORY	CORRECTED COUNT	ARTICLES
1	The University of Tokyo	Japan	7.47	18
2	Chinese Academy of Sciences (CAS)	China	4.30	12
3	RIKEN	Japan	3.36	9
4	Osaka University	Korea	3.16	9
5	Seoul National University	Korea	2.15	5

GLOBAL TOP 100

BASED ON THE BETA WEBSITE OF THE NATURE PUBLISHING INDEX GLOBAL TOP 100

www.natureasia.com/publishing-index/global

The Nature Publishing Index Global Top 100 was developed as a result of the interest generated by the release of the Nature Publishing Index Global Top 50, which was launched simultaneously with the publication of the Nature Publishing Index 2010 (Asia-Pacific) in 2011. In response to requests from many readers for more extensive data, we have this year doubled the reach of the global index in this publication to present data on the top 100 world research institutions. The purpose of the global index is to allow our readers to gain an insight into where some of the best research in the world is being carried out across the broad range of fields encompassed by NPG's Nature-branded primary research journals in life sciences, physics, chemistry, materials, nanotechnology, photonics and geoscience.

Whilst the resulting Nature Publishing Index Global Top 100 is largely populated by institutions from the United States and Europe, the Asia-Pacific region is well represented with a total of 14 institutions from the region – based in Japan, China, Australia and Korea – appearing in the top 100, a point that bodes well for the future performance of Asia-Pacific nations in the Nature Publishing Index.

NATURE PUBLISHING INDEX 2011 GLOBAL TOP 100

2011 RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES
1	Harvard University	USA	129.92	289
2	Stanford University	USA	67.48	140
3	Max Planck Institutes	Germany	63.87	159
4	National Institutes of Health (NIH)	USA	58.11	153
5	The University of Tokyo	Japan	42.88	109
6	French National Centre for Scientific Research (CNRS)	France	42.51	203
7	University of California Berkeley	USA	37.60	91
8	Yale University	USA	36.92	84
9	University of California San Diego (UCSD)	USA	34.27	103
10	University of California San Francisco (UCSF)	USA	34.15	91
11	Massachusetts Institute of Technology (MIT)	USA	33.31	91
12	University of Oxford	UK	31.04	120
13	University of Washington	USA	29.46	85
14	University of Cambridge	UK	28.90	113
15	Columbia University in the City of New York	USA	28.36	79
16	University of Michigan	USA	26.51	81
17	University of Illinois	USA	25.72	48
18	The Scripps Research Institute	USA	24.92	53
19	California Institute of Technology	USA	24.69	50
20	Kyoto University	Japan	23.98	56
21	Medical Research Council (MRC)	UK	22.93	85
22	The Johns Hopkins University	USA	22.80	82
23	Chinese Academy of Sciences (CAS)	China	22.43	62
24	Swiss Federal Institute of Technology Zurich	Switzerland	22.07	48

2011 RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES
25	University of Toronto	Canada	21.94	79
26	University of London - University College London	UK	21.34	71
27	The Rockefeller University	USA	21.19	39
28	Cornell University	USA	21.01	70
29	Northwestern University	USA	20.20	50
30	RIKEN	Japan	19.96	70
31	Memorial Sloan-Kettering Cancer Center	USA	19.25	43
32	University of Chicago	USA	19.22	47
33	University of Pennsylvania	USA	18.54	61
34	University of California Los Angeles (UCLA)	USA	17.37	57
35	Osaka University	Japan	17.31	48
36	Imperial College London	UK	16.60	59
37	University of Wisconsin-Madison	USA	16.55	51
38	Lawrence Berkeley National Laboratory	USA	14.67	67
39	Duke University	USA	14.43	44
40	Washington University in St. Louis	USA	13.92	55
41	University of Maryland	USA	13.83	47
42	New York University	USA	13.62	32
43	Weizmann Institute of Science	Israel	13.12	32
44	National Institute of Standards and Technology (NIST)	USA	12.84	29
45	Swiss Federal Institute of Technology (EPFL)	Switzerland	12.66	30
46	Princeton University	USA	12.46	30
47	University of Tennessee	USA	12.37	37
48	The University of British Columbia	Canada	11.92	43

2011 RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES
49	The University of Texas at Austin	USA	11.76	25
50	National Institute for Health and Medical Research (INSERM)	France	11.56	90
51	Spanish National Research Council (CSIC)	Spain	11.48	59
52	Seoul National University	Korea	11.27	32
53	Tohoku University	Japan	11.01	29
54	Wellcome Trust Sanger Institute	UK	10.98	53
55	Ludwig Maximilian University of Munich (LMU)	Germany	10.95	53
56	University of Colorado Boulder	USA	10.92	35
57	The University of Edinburgh	UK	10.89	51
58	Broad Institute of MIT and Harvard	USA	10.86	55
59	University of Bristol	UK	10.83	34
60	Yeshiva University	USA	10.83	26
61	Cold Spring Harbor Laboratory	USA	10.75	26
62	The University of Texas MD Anderson Cancer Center	USA	10.36	34
63	University of California Santa Barbara (UCSB)	USA	10.20	25
64	The University of Melbourne	Australia	9.83	46
65	Salk Institute for Biological Studies	USA	9.69	17
66	Nagoya University	Japan	9.67	26
67	University of Massachusetts Worcester	USA	9.56	23
68	University of North Carolina at Chapel Hill	USA	9.55	41
69	The University of Texas Southwestern Medical Center at Dallas	USA	9.20	17
70	Brown University	USA	9.09	22
71	National Institute of Advanced Industrial Science and Technology (AIST)	Japan	9.03	22
72	University of Copenhagen	Denmark	8.98	51
73	Helmholtz Association of German Research Centres	Germany	8.78	54

2011 RANK	INSTITUTION	COUNTRY	CORRECTED COUNT	ARTICLES
74	Rice University	USA	8.74	17
75	Cancer Research UK	UK	8.59	36
76	University of Science and Technology of China	China	8.58	17
77	Emory University	USA	8.49	34
78	University of Geneva	Switzerland	8.46	30
79	University of Zurich (UZH)	Switzerland	8.45	33
80	Boston University	USA	8.32	36
81	Los Alamos National Laboratory (LANL)	USA	8.24	26
82	University of Southern California (USC)	USA	8.16	39
83	University of California Irvine (UCI)	USA	7.88	24
84	Utrecht University	Netherlands	7.87	36
85	University of Groningen	Netherlands	7.74	26
86	The University of Queensland	Australia	7.70	34
87	University of California Davis	USA	7.68	24
88	Technical University Munich (TUM)	Germany	7.63	38
89	Genentech, Inc.	USA	7.63	11
90	University of Goettingen	Germany	7.62	25
91	The Ohio State University	USA	7.45	24
92	Pennsylvania State University	USA	7.43	32
93	Oregon Health & Science University (OHSU)	USA	7.26	17
94	Peking University	China	7.24	21
95	The University of Manchester	UK	7.24	27
96	University of Hamburg	Germany	7.22	29
97	Australian National University	Australia	7.18	13
98	McGill University	Canada	7.17	25
99	Howard Hughes Medical Institute (HHMI)	USA	7.04	11
100	University of Pittsburgh	USA	7.03	32

The data for the Global Top 100 is drawn from the beta website of the Nature Publishing Index Global Top 100 (www.natureasia/publishing-index/global). We welcome feedback from readers on the website and the way results are presented.

Results for organizations that include numerous sub-entities (e.g. the Max Planck Institutes) are presented as aggregates of all contributing entities in the beta index. An exception to this rule is the University of California System, for which each of the ten universities of the system are presented individually. On aggregate count, the University of California System has a corrected count in excess of 142 and would be ranked number one.

The Nature Publishing Index Global Top 100 is produced in col - laboration with Digital Science (www.digital-science.com), a division of Macmillan Publishers Ltd, owner of Nature.

The University of Tokyo

LEADING JAPAN IN TROUBLED TIMES

The University of Tokyo is steering science, and Japan, past an extraordinary disaster and chronic challenges to propitious waters.

Japan experienced many challenges in 2011. A strong yen exacerbated ongoing economic problems, a tsunami devastated the northeast of the country, and a nuclear disaster complicated Japan's already fraught energy policy. The impression of danger drove away foreign scientists and students when the country, facing decreasing numbers of domestic university students, was becoming more dependent on them.

The University of Tokyo stood up to these challenges, finding strength in its traditions and the creative abilities of its members.

In the immediate aftermath of the tsunami, the university set up an office to coordinate support for the Tohoku region and to assist students keen to volunteer. The university's Radioisotope Center led the way in assessing the threat of nuclear radiation near the troubled nuclear reactor and in Tokyo, providing a critical yet constructive perspective that was sometimes at odds with the government's analysis. The university also offered a vision for a sustainable future, cutting its electricity consumption by 30% while maintaining its key research and education functions.

Buildings and facilities damaged by the earthquake were quickly repaired. Assured of a safe environment, most university staff, including many from abroad, returned. With some semblance of normality, the university could return to its perennial challenges of attracting the world's best students and staff while securing the resources to support research and education.

On this front, too, the University of Tokyo has demonstrated leadership. To stay internationally competitive, Japan must increase exchange with other countries, but the commencement of its academic year in April makes it difficult for students and academics in other countries to come without disrupting their schedules. University of Tokyo president Junichi Hamada is pushing an initiative that would better align Japan's academic year with that of other countries, and is trying to win support for it from other universities.

The university is blazing trails in other ways. This year the university's Institute for the Mathematics and Physics of the Universe (IPMU) was selected as the country's first institute endowed by the Kavli Foundation, a California-based philanthropic organization devoted to the promotion of astrophysics, nanoscience, neuroscience and theoretical physics. "The Kavli Foundation's selection criteria are simple", says founder Fred Kavli: "Select the best research group backed up by the strongest university."

President Hamada welcomed the Kavli Foundation's support of the Kavli IPMU not only because it guarantees that the institute will remain at the forefront of its field tomorrow, but also because it sets a precedent for finding new ways to support and guarantee innovation in research, in line with the activities of successful universities in the United States and elsewhere. "The achievements of the IPMU are proof of the huge potential of international collaboration between Todai and our international partners for ensuring outstanding and innovative research," says Hamada.

This development could set a model for other universities. But it should also offer an opportunity for Japanese policymakers, companies, and citizens to reflect on the value of research and consider giving more, according to university Executive Vice President Masako Egawa. Commenting on the new Kavli institute, Egawa noted that the US spends more than 20 times what Japan does on philanthropy, and called on the government to change the laws to facilitate donations and to deregulate investments by universities.

These efforts are made to create and preserve an environment that encourages research innovation and excellence. That effort is made worthwhile by the achievements of the university's world-class scientists. The accomplishments of a select few are detailed in the following pages. ■

THE UNIVERSITY OF TOKYO

The expanding universe of the IPMU

A University of Tokyo institute earns permanent support for its ambitious attempt to integrate mathematics, physics and cosmology.

The University of Tokyo has long driven change and produced startling discoveries, but the success of the Institute for the Physics and Mathematics of the Universe (IPMU) in achieving both is surprising even its architect, Hitoshi Murayama.

The IPMU was established in 2007 as one of Japan's five elite World Premier International Research Centers (WPIs). With generous funding and rare autonomy, the WPIs are conducting world-class, interdisciplinary research and setting new models for acquiring knowledge.

At its mid-term evaluation in 2011, the IPMU received the only "S" (superior) grade among the five WPIs. An international review committee congratulated the institute on its cross-stimulation between particle physics and cosmology, and its fusion of string theory and mathematics which has the potential to create a new branch of mathematics. Because of such close collaborations, young researchers have bridges to go back and forth between math and physics, the committee noted.

Creating a dynamic mix at its afternoon coffee breaks, 21% of IPMU's principal investigators and 75% of its postdoctoral researchers come from overseas. In an independent poll of researchers in related fields around the world, more than 80% of the respondents said they were interested or very interested in collaborating with the IPMU — within just five years of its existence.

IPMU's research successes have caught the attention of international community. These include John Silverman's discovery of the critical role that interactions between galaxies play in formation of black holes; Naoki Yoshida's simulation of the origin of star formation, which will drive experimental design the next generation space telescopes; and Murayama's work on a massive census of galaxies using a souped-up version of the Subaru telescope. Murayama modestly compares the upgraded telescope, expected to see first light in May 2012, to a big digital camera. But that description belies its revolutionary potential to see a billion galaxies. "We'll be able to do in one year what would have taken the Hubble a thousand years," he says.

In recognition of IPMU's importance, in a re-organization in January 2011 that required a historic change to university bylaws, the University of Tokyo (known locally as Todai) created the Todai Institutes of Advanced Study as an umbrella organization so that the IPMU could have a permanent home beyond its ten-year WPI contract.

Funding for the IPMU was guaranteed when the Kavli Foundation, a southern California-based philanthropic organization devoted to the promotion of astrophysics, nanoscience, neuroscience and theoretical physics, decided to make the IPMU its 16th institute worldwide and its first in Japan. The US$7.5-million endowment is the first step to both extending the longevity of the IPMU and allowing it to continue the same types of freedom it has enjoyed in the past.

This is the first time a Japanese national university will have a research institute running on an endowment from a private, foreign donor. "There was no precedent for such a thing," says Murayama.

Philanthropic support for research in Japan is not traditional, but the IPMU is clearing the way for new funding opportunities and, in a country that can seem closed sometimes, new models of international exchange are needed. Indeed, founder Fred Kavli said his goal in establishing the Kavli IPMU was to demonstrate that the quest for knowledge has no boundaries, and that finding the answers to some of science's biggest and most fundamental questions itself requires international collaboration. The IPMU is well on track to achieve his goal. ■

KAVLI IPMU INSTITUTE FOR THE PHYSICS AND MATHEMATICS OF THE UNIVERSE

www.ipmu.jp/

THE UNIVERSITY OF TOKYO

Energy powder for a greener future

Chemical engineer Kazunari Domen is developing new ways to harness the sun's energy.

A common dream of automotive engineers, environmentalists and sustainable energy advocates is a car that runs on hydrogen fuel cells, giving off nothing but water as its exhaust. The problem, though, is producing the hydrogen in a sustainable way.

The sun is the natural place to look, and scientists around the world are trying to find efficient ways to use photoelectrodes to split water into hydrogen and oxygen. Photoelectrodes have been refined over the past decades but a bottleneck remains, says Kazunari Domen, a photocatalyst expert at the University of Tokyo. To get a sufficient amount of energy, the costly devices would need to be spread over a huge area.

Judging from decades of research in Domen's laboratory, it could well be powders that prove better at splitting water with the sun's energy. "The powder system is highly scalable," says Domen. "You just spread it on glass plate and heat to fix it. That's all."

If a powder is designed properly, incoming light will produce paired holes in its valence bands and electrons in its conduction bands, creating the potential for electrolytic reactions that decompose water into H_2 and O_2. The trick is finding powders that can achieve this efficiently. Domen has been hammering away at that goal for three decades, establishing himself as the leader in the field. In 1980, he found that strontium titanate modified by nickel oxide was able to do the job. Over the next two decades, he found several other candidates. But they required ultraviolet light. Domen wanted to use the more plentiful visible light. Ten years ago, he proved that oxynitride worked. "That was the most exciting time," he says. Since then, he has been working to improve the efficiency, and while others have come to compete, he still leads the field with a system that converts 0.2% of the solar energy to hydrogen. In the next five to ten years, Domen plans to increase that to 5%.

"The problem is finding suitable materials for water splitting," he says. Treatment with ammonia at high temperatures during the manufacturing of the powder, for example, causes defects that decrease efficiency. Industrial collaborators are providing helpful hints. "We found the materials, but they pointed out that we need higher quality materials," says Domen.

Domen is a much sought after by industry. His partners include the Mitsubishi Chemical Group Science and Technology Research Institute, The KAITEKI Institute, JX Nippon Oil & Energy, as well as companies in France, Canada and Brazil. "They provide not only funding but also techniques," says Domen. Mitsubishi, for example, is developing a special membrane to separate oxygen and hydrogen mixture in a safe way.

Domen is also a leader in the new material design community and has academic collaborations in Denmark, the United States, China, the United Kingdom, Germany and Saudi Arabia. Many come to him for help in testing the water-splitting properties of their own materials. Some also send their students to study in Domen's laboratory.

The backbone of Domen's work, however, is his team of 40 researchers at the University of Tokyo. Non-Japanese researchers account for 50%. "Our group is increasingly international, and they enjoy learning from each other," he says.

In the next 10 to 20 years, Domen dreams of creating a viable hydrogen power supply. He is also developing the reverse process, in which the hydrogen is put to use in polymer electrolyte fuel cells that could power cars or other devices. "Currently platinum is used, but it is too expensive and scarce. We need to use an abundant cheap source, not a precious metal," he says. ■

Domen Laboratory
Chemical System Engineering
www.domen.t.u-tokyo.ac.jp

THE UNIVERSITY OF TOKYO

Flexible electronics pave the way for novel medical devices

Takao Someya returned to Japan nine years ago intent on making a more pliable transistor. He succeeded.

The University of Tokyo's Takao Someya is a veteran researcher of flexible electronics. He is famous not only among his peers, but also in the mainstream media. His successful development of a flexible, large-area sensor array, dubbed a thin skin, can detect pressure and temperature and could eventually be used in prosthetics. The thin skin ranked as one of Time magazine's "Best Inventions 2005" and appeared on the magazine's cover. Someya's solid reputation as a scientist has earned him a position on the board of the US Materials Research Society and a Princeton Global Scholar visiting professorship. He was also made the General Chair of the International Conference on Flexible and the Printed Electronics, and a Distinguished Lecturer of the IEEE Electron Device Society.

Someya's latest feat — an ultrathin, flexible, yet sturdy transistor based on a film just 2 nanometers thick — could accelerate the introduction of implantable medical devices and revolutionize the way medicine is practiced.

The first step required reducing the driving voltage to power the device. "For that, miniaturization was essential, and thinness was essential," he explains. To form the thin film, Someya's team used a molecular self-assembled monolayer.

But that success brought another concern. "At 2 nanometers, we feared that the film would easily develop holes," says Someya. And proving that the device was working was no easy feat. Someya consulted a collaborator at Princeton University and was able to examine his device at an x-ray beamline at Brookhaven National Laboratory in the USA. To his relief, even when the device was active, the thin-film membrane stayed intact.

Even more surprising, the transistor could withstand temperatures of 150 °C for 20 seconds. "That was a crucial achievement," notes Someya. People around the world are competing to make wearable electronics and monitors that can be put in the body. "Organic semiconductors were looking promising," he notes, "but for use in a medical device it would need to be sterilized, and no one thought that possible."

Someya attributes his success, in part, to the tremendous fabrication technologies at the University of Tokyo. "We are the only laboratory in Japan, and one of very few laboratories in the world, that can manufacture flexible, organic and integrated circuits using a printing process," he explains.

But Someya also credits the researchers in his laboratory, where flexibility and freedom are also important because he believes they create the best academic atmosphere for tapping into the creative juices of young researchers. An ongoing influx of new ideas from outside maintains the laboratory's vigor. He has collaborations with Princeton University in the US and the Johannes Kepler University of Linz in Germany, as well as foreign postdoctoral researchers, graduate students and interns. "Flexible electronics is a multidisciplinary research field, and it is very important to promote interactions with researchers from different fields and backgrounds," Someya notes.

The flexible transistor will be carried forward as part of Japan's Bio-harmonized Electronics Project. The next step is to start using the flexible electronics in clinical trials, something that Someya is undertaking with the university's medical department. If all goes well, devices will soon be so small that they will be invisible — unlike today's bulky pacemakers and other implantable devices. Someya will also be closer to realizing his dream of flexible electronics that are in harmony with the body. ■

Takao Someya Group
Organic Transistor Lab
www.ntech.t.u-tokyo.ac.jp/index.en.htm

THE UNIVERSITY OF TOKYO

Understanding protein function: when less is more

Membrane protein expert Chikashi Toyoshima's focused approach to revealing the functions of important proteins is yielding important results.

When someone figures out how to treat diseases related to the sarcoplasmic reticulum in muscle cells, such as Brody myopathy, Darier disease, and some forms of heart failure, they — and the patients who benefit — will need to thank Chikashi Toyoshima for his meticulous work at the University of Tokyo. In fact, his research on the calcium (Ca^{2+}) ion pump in these cells will also have biomedical and basic research beneficiaries in many other fields.

The sarcoplasmic reticulum stores calcium ions that are released into muscle cells in response to electric stimulation of the muscle. These ions are pumped back by enzymes known as ATPases that power this cycle. Toyoshima has painstakingly captured this entire reaction cycle in stop motion by determining the crystal structures of the pump's seven reaction intermediates.

While many crystallography research groups quickly tick off structures of easily accessible proteins, Toyoshima has relentlessly focused on a very small number of proteins. "This is because we are interested in understanding the functions of biologically important proteins based on their atomic structures, rather than molecular anatomy," he explains. "To understand a protein requires determination of atomic structures of all reaction intermediates."

The reward is high-level comprehension that Toyoshima describes modestly: "We now roughly understand how ion pumps work." And many others do too — a 2000 paper on the sarcoplasmic reticulum calcium pump has received over 1,000 citations.

That, however, is not the end of the story. The group now produces large amounts of recombinant Ca^{2+} pump proteins and crystallizes them. "This is a critical step," says Toyoshima. "It was previously impossible to stop the reaction cycle just after the binding of the first Ca^{2+}, but now we can do that."

The work, which will come out in two major publications, took several years and will have no competition.

Toyoshima is, however, in stiff competition with one Danish group on the Ca^{2+} pump and understanding the sodium–potassium pump. "This is at least equally as important as the Ca^{2+} pump, both medically and biologically," Toyoshima says.

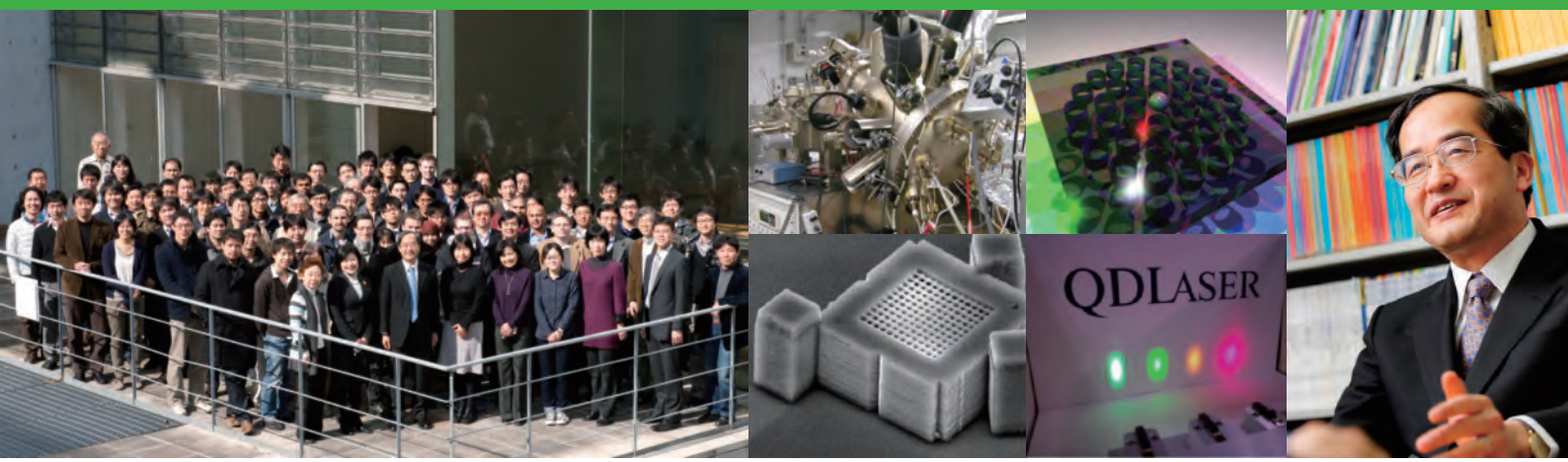
Already, he has provided the first high-resolution crystal structure and revealed the binding mode of the cardiotonic glycoside, ouabain, an extract from African plants or tree bark that has been used to treat heart failure for more than 200 years. The drug works by binding to and inhibiting the sodium pump.

His successes have won him election as a foreign associate of the US National Academy of Sciences, the Asahi Prize (one of the largest prizes in Japan), and the Yamazaki Teiichi Prize, awarded by the Foundation for the Promotion of Material Science and Technology of Japan, among other honors. His reputation keeps a steady flow of international doctoral students and postdoctoral researchers to his laboratory.

Still, Toyoshima keeps his laboratory small. "The number of students per professor is much smaller than other universities, meaning that teaching duty is considerably less," he says. This allows more time for research, but it also means less manpower, a crucial element especially in labor-intensive crystallography studies. Fortunately, the Institute of Molecular and Cellular Biosciences, which Toyoshima belongs to, allows him and other principal investigators to have a technician dedicated to his laboratory. "Even within the University of Tokyo, that does not always happen," he says. "For crystallography of membrane proteins, this is an enormous benefit."

The low-key, understated approach has worked well for Toyoshima and his colleagues. "Altogether my institute is good for a scientist who wants to have a small but professional group," he says. ■

Lab. of Membrane Proteins, Toyoshima Group
Institute of Molecular and Cellular Biosciences
http://www.iam.u-tokyo.ac.jp/StrBiol/en/



THE UNIVERSITY OF TOKYO

Framing the future of electronics and photonics

Electronics researcher Yasuhiko Arakawa is pushing quantum dot research to new dimensions and forging the future of LSIs—circuits with ever-increasing numbers of transistors.

Quantum dots are set to revolutionize a wide range of technologies, including lasers, quantum information systems, solar cells and LEDs. No one is more excited about, or more devoted to, this future potential than the University of Tokyo's Yasuhiko Arakawa, a leader in this field for three decades.

In 1982, Arakawa published a research paper proposing the concept of quantum dots and their application in lasers. That paper has since achieved over 2,000 citations. He also discovered the cavity–polariton effect in semiconductors in 1992; publication of that work garnered over 1,000 citations, and launched the field of cavity–polariton physics and polariton laser research based on quantum wells and planar nanocavities.

Now, as the head of two major national projects, Arakawa is pushing quantum dot boundaries even further.

In 2010, for example, he created an artificial single-atom laser in a single-dot photonic-crystal nanocavity system. Despite this advance, Arakawa found that the two-dimensional nano-cavity system was insufficient to produce the highly efficient single quantum dot nanolasers that he envisaged. "Some kinds of photons cannot be fully confined," he explains. One of his goals is to realize strong interactions between electrons and photons that are confined in three dimensions. In 2011, he moved a step closer to that goal when he produced lasing in a three-dimensional photonic crystal.

Meanwhile, Arakawa is advancing practical applications for his work. In 2004, working with industrial partners, he created quantum dot lasers with high temperature-stability and high-speed direct modulation. The quantum dot laser was commercialized in 2010 by a Kanagawa-based venture company, QD Laser. With 100,000 units shipped in its first year, laser sales had jumped to 500,000 units by the end of 2011.

The ability to make photons work in semiconductors could provide a much-needed quantum leap in electronics. The biannual doubling of semiconductor capacity — predicted in 1965 and supporting the explosion of semiconductor-dependent products thereafter — is reaching its limits due to heating and bandwidth problems. "This trend will end," says Arakawa. "We need a breakthrough. Most large-scale integration (LSI) people are still just doing electronics," he says. "Optical interconnect technology will produce that breakthrough," he says.

Selection of Arakawa's work as one of the thirty Funding Program for World-Leading Innovative R&D Science and Technology (FIRST) projects reflects his leadership in this field. With funding of JP¥4.5 billion for four years, Arakawa is collaborating with Japan's industrial powerhouses, including Hitachi, Fujitsu, NTT and NEC to overcome the future limitations of fitting more transistors on circuits. The collaboration has produced quantum-dot laser-light sources on silicon using a special wafer bonding technique.

Arakawa also heads the Institute for Nano Quantum Information Electronics, which was launched in 2006. The institute has funding of JP¥700 million per year for ten years, and brings together 20 professors from Japan's top universities and four companies with matching funds. Each company has opened a laboratory on the University of Tokyo campus that focuses on specific research topics such as quantum lasers, quantum information, quantum dot solar cells and flexible electronics.

For his success, Arakawa credits his huge clean room for nanostructure growth and processing, laser spectroscopy laboratories and his enthusiastic young researchers — 50% of them hail from Europe or neighboring Asian countries. His driving force, however, is the experience he gained during his 30 years of research on quantum dots and his ardent desire to see quantum dot science and technology blossom. ■

Institute for Nano Quantum Information Electronics
www.nanoquine.iis.u-tokyo.ac.jp/index-e.html

Okinawa Institute of Science and Technology Graduate University (OIST)

SUB-TROPICAL JAPAN BREEDS RESEARCH EXCELLENCE

Most scientists familiar with research in Japan may be surprised to learn the unique attributes of the Okinawa Institute of Science and Technology Graduate School (OIST): it is a Japanese university operating fully in English, without hierarchy or academic compartmentalization, where researchers are asked to resist the trend towards specialization and where young, independent scientists mix freely with senior professors. OIST is quickly becoming the most international and energetic research university in the country.

Researchers are rushing to OIST from top academic institutions across the globe in search of something increasingly difficult to find elsewhere: freedom to follow their curiosity. As a bonus, nestled in the protected forest of a sub-tropical island, they find an expansive, modern building designed by a Nikken Sekkei team led by Takashi Okamoto and Kenneth Kornberg — son of a Nobel prize winning molecular biologist and brother to another — to stimulate scientific creativity.

Stellar recruits

Launched a decade ago, OIST established a powerful, core, research faculty around figures such as Kenji Doya whose blend of robotics and neurobiology research has produced a broad range of research findings. Last year, OIST President Jonathan Dorfan went on a recruiting drive. OIST now has over 200 researchers spread over five priority fields — neuroscience; molecular, cell, and developmental biology; mathematical and computational sciences; environmental and ecological sciences; and physics and chemistry. Researchers within OIST's 44 independent research units, however, follow whatever scientific direction captures their interest. Inaugurated as a graduate university last November, the OIST will welcome its first class of 20 graduate students in the latter half of 2012.

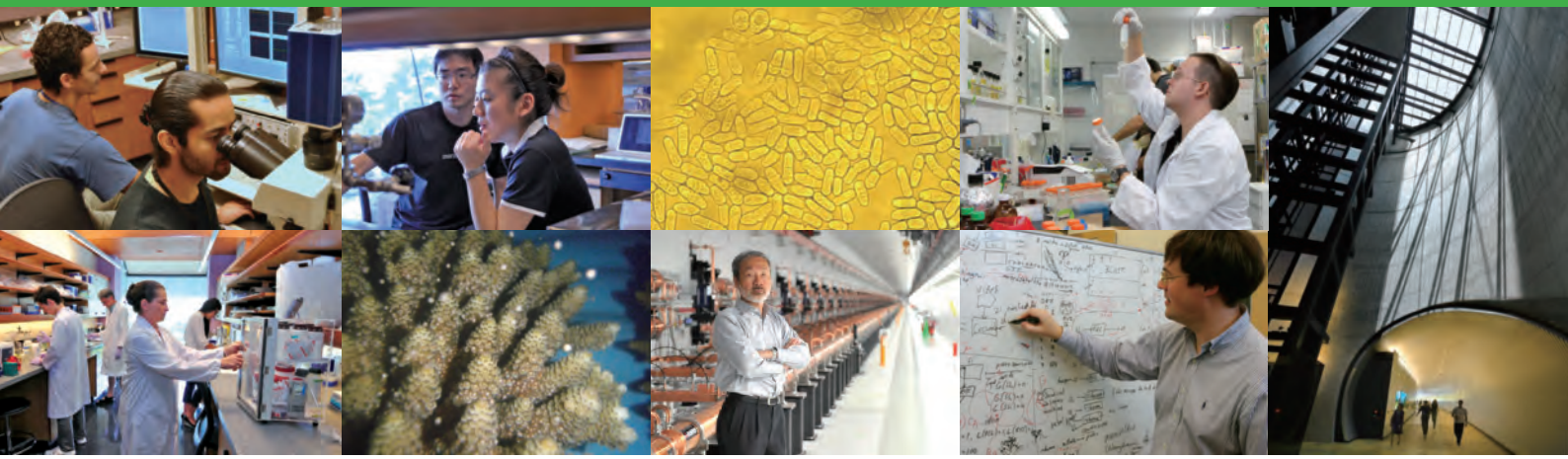
Scientific publications from OIST have increased dramatically, jumping some 40% to nearly 80 peer-reviewed publications in 2010. The increase is coming exactly how Dorfan wants it: with high impact papers in top research journals.

That pace is set to increase as the new recruits roll in, stimulated by the research culture. "The research support provided at OIST translates to what I consider the cardinal value of academic life: intellectual freedom," says OIST researcher Pinaki Chakraborty, who is studying the mechanics of turbulent and geological flows. Academic life elsewhere can be a time-consuming and an "unceasing existential struggle for research grants," he adds. Mathematician and systems biologist Tatiana Marquez-Lago, similarly sees working at OIST as a rare chance to perform cutting-edge research "devoid of inefficient practices accumulated through the years or inherited from obsolete structures."

The generous start-up funding and complete freedom to choose the direction of his research also attracted Denis Konstantinov to OIST. As an experimentalist working with high magnetic fields and ultra-low temperatures to study the mechanism of microwave-induced zero conductance states, Konstantinov had high requirements in setting up a laboratory. OIST has struck the right balance of Western independence in communication between very young researchers and senior scientists, and a sense of Japanese order and security in institute management, according to Konstantinov.

Sterling equipment

Dorfan knew he would need top-notch equipment to win the caliber of scientist that he wanted. Befitting OIST's diversity of exploration, OIST has assembled a broad collection, including multiple electron and two-photon microscopes, several of the latest model gene sequencers, with planning well-advanced for



a table-top X-ray source and a coastal ocean-observing system.

OIST's state-of-the-art, high-resolution, cryo-electron microscopy combined with a significant computational infrastructure, in part, lured biophysicist Matthias Wolf from the USA. He is studying the conformational changes of the papillomavirus capsid as it enters cells at near atomic resolution. As important as the hardware was, the technical competence of his new colleagues, who he describes as senior mentors with global experience, was irresistible. His colleagues now include Nobel laureate geneticist Sydney Brenner, Dorfan, Robert Baughman, a neurobiologist with a wealth of experience in science policy and funding, Mitsuhiro Yanagida, famed for his work using yeast to untangle chromosome segregation, and Ulf Skoglund, who is pioneering the use of electron tomography to image molecular mechanisms within cells.

Wolf notes that this rich environment will allow him to grow beyond his current scientific insights. He also says that OIST's broad vision allows creative cross fertilization while retaining structure. "Unlike other places with similar resources and ambitions, OIST provides a more general focus with a solid foundation in the physical sciences."

Interdisciplinary strength

Researchers from different backgrounds are expected to mingle at OIST. The key to justifying such intellectual diversity is making it more than the sum of its parts. Scientists must look beyond their own fields for new ideas. Even Kornberg's building design is meant to make people with no connection cross paths regularly.

Yabing Qi, who holds simultaneous interests in developing organic electronics for use in energy materials and devices as well as a molecular level understanding of structure-property relationship in organic and inorganic nanomaterials, appreciates the interdisciplinary mindset that pervades OIST. "The non-departmental academic structure of OIST provides an ideal environment for my research," says Qi, who hopes to create a novel nanostructured inorganic/organic hybrid solar cell at the institute.

That atmosphere also appealed to Nicholas Luscombe, a life scientist from the UK. Luscombe, who spent his childhood in Japan, had long sought an academic homecoming but found it impossible in the traditional Japanese academic environment. OIST's interdisciplinary, collaborative, and international atmosphere, with its level structure, made him jump at the chance. Luscombe was also excited by the excellent genomic facilities that enabled sequencing of interesting marine invertebrates such as coral and octopus. "These have been neglected elsewhere because they are not directly relevant to human health. But they are nonetheless important for biological research," he says.

Veteran researchers too are finding OIST a place of new challenges. For the first time in his long career, world-renowned developmental biologist Noriyuki Satoh was able to lead a sequencing project from sample collection to sequencing and analysis when he pieced together the coral genome in an attempt to understand why some species bleached in the summer of 1998. This feat was made possible by the generous sequencing capacity at OIST. Satoh and his colleagues then moved to another fittingly marine success with the pearl oyster genome.

Solution central

Although the grand space in a beautiful natural setting comes at a price — isolation from the established academic centers — for most, concerns over isolation quickly dissipated. Guest lecturers visit on a regular basis. And, seasonal workshops lasting one to two weeks — covering topics from complex quantum systems to computational neuroscience to comparative genomics to fluorescence microscopy — regularly bring in renowned guest teachers.

Marquez-Lago says concerns about the distance to collaborators in Europe and North America was easily solved with flexibility and great support for traveling. "What struck me the most about OIST is everyone's visible willingness to simply do their best, and come up with creative solutions to approach all challenges." She adds, "OIST refreshingly embodies the phrase 'where there's a will, there's a way,' a much needed attitude towards education and science." ■

RIKEN

KEEPING JAPAN AT THE FOREFRONT

When Japan's SPring-8 Angstrom Compact Free Electron Laser (SACLA) produced a high-intensity light at 1.2 Angstroms in June 2011, scientists moved a step closer to having a highly powerful x-ray free electron laser (XFEL) to image miniature structures at scales not possible with other devices. Because of its advantages, i.e. the short wavelengths and short pulses, XFEL make it possible, for example, to visualize the movement of microstructures in biological cells and electron dynamics in materials. Based at the RIKEN Harima Institute, SACLA will be opened in March 2012 to scientists from Japan and abroad. Applications resulting from work at SACLA could range from drug development to new materials used to create renewable energy.

SACLA is just one example of the investments that RIKEN has made to remain at the forefront of international scientific developments. Established in 1917 as a physics and chemistry research institute, RIKEN subsequently expanded into biological and other sciences. The 19 research institutes, centers and programs located at RIKEN's 7 institutes now form a major core of Japan's vigorous research community.

Take, for instance, the 'K computer', the renowned fruit of a collaboration between Fujitsu Limited and RIKEN Advanced Institute for Computational Science (AICS) in Kobe. Expected to be completed in the fall 2012, it is the first computer to reach computation speed of 10 petaflops. In June 2011, this computer was crowned the world's fastest, and even in the rapidly changing world of supercomputers, it retained that top rank in November 2011 by an easy margin — it is more powerful than the next seven supercomputers on the TOP500 list combined.

Pioneers pushing the boundaries

RIKEN's human resources, however, make it a true powerhouse. Some 400 principal investigators, all leaders in their respective fields, earnestly carry the weight of responsibility for keeping Japan at the cutting edge.

A leading example is Yoshiki Sasai, the principal investigator of the Laboratory for Organogenesis and Neurogenesis at RIKEN's Center for Developmental Biology (CDB) in the RIKEN Kobe Institute. Sasai's group surprised stem cell and developmental biologists around the world last year when it created an optic cup *in vitro*. As reported in the journal *Nature*, the researchers started with mouse embryonic stem cells and coaxed them to form all seven retinal cell types of a cup-shaped organ. To Sasai's surprise, the cells aligned with the right symmetry and size and even formed synapses. Startlingly, the cells also folded over to form the three-dimensional cup[1]. "It was very similar to what you see in the embryo. It was recapitulating development," says Sasai.

In the long term, various retinal diseases could be treated by transplanting artificial tissue. Shorter term, artificial eyes developed from cells of patients with eye-related genetic diseases could be used to study such diseases and test candidate drugs for their treatment.

For scientists, the achievement also provided evidence to settle an age-old debate. During development, do cells such as retinal precursor cells drive themselves toward tissue creation or do they depend on signals from neighboring tissues? This experiment suggests that "cells know what to make, and they know it at a very high level," says Sasai. This clearly has implications for other tissues and a wide body of researchers across the globe.

Being at RIKEN stimulated Sasai's work. Discussions with experts in fetal development allowed him to merge "cutting-edge technology of embryology and stem cell biology." He looked even further afield within RIKEN for help in understanding the complex physics of the incredible phenomenon he was observing. Taiji Adachi,

a former head of RIKEN's Computational Cell Biomechanics Team at the RIKEN Wako Institute in Saitama and currently a professor at Kyoto University, offered mathematical modeling. "The combination of different expertise and environment gave us a lot of stimulation and clues for doing this kind of work," says Sasai.

Sasai is now sought globally for technical consultation with industry, research guidance, and collaborations. He looks forward to working with CDB's Masayo Takahashi, who has long focused on retinal regeneration, for application to humans. With other achievements under his belt — including creating an artificial cerebral cortex and pituitary gland — his influence is set to grow.

Franco Nori, who came from the University of Michigan to head the Digital Materials Team at RIKEN Advanced Science Institute (ASI) in the RIKEN Wako Institute in 2002, has likewise found fertile, interdisciplinary ground in RIKEN's "outstanding research environment." To carry out his seminal research in quantum circuitry, atomic physics, and energy-related fields such as solar cells, light-to-electricity conversion, and proton pumps, he motivated researchers from different backgrounds and sub-fields to work together in new and interdisciplinary areas.

Most recently, the group's research featured in the discovery that something can come from nothing. All space, including the vacuum, has long been known to teem with the activity of evanescent "virtual" particles — a creation of quantum fluctuations that flip in and out of existence. "These fluctuations, however fleeting, are the origin of some of the most important physical processes in the universe," says Nori. But researchers had failed to observe directly the quantum properties of this vacuum state.

Nori's team succeeded using superconducting circuit devices, which could modulate the boundary conditions of the electromagnetic field with velocities near the speed of light — fast enough to achieve the "dynamical Casimir effect," by which virtual photons are converted into real light[2].

As formulated originally, achieving the dynamical Casimir effect would require a mirror moving near the speed of light. Nori's team used a different method, based on a new and rapidly advancing field of physics in which certain circuits on chips behave like artificial atoms. According to Nori, these artificial atoms can be designed to have specific properties not found in natural atoms, and can be used to study atomic and quantum phenomena.

Nori says that showing the dynamical Casimir effect is just one indication of the potentially far-reaching applications of these artificial atoms[3]. "This effect is like attaching voltmeters, wires, and current generators to giant atoms," he says.

The work has earned international recognition. Not only was it published in *Nature*, it saw quantum physics claim front-page space in major international newspapers. The study also ranked in the top five "breakthroughs of the year" in Physics World, and became the "most read news story of 2011" on Nature News. Nori says the team had to work hard —"more perspiration than inspiration, unfortunately." Still, many of his most successful prodigies keep returning to RIKEN for inspiration, he says.

With such infrastructure and inspiration, RIKEN continues to build the foundation of Japan's scientific future. ■

1. M. Eiraku, *et al. Nature* **472**, 51–56 (2011)
2. C.M. Wilson, *et al. Nature* **479**, 376–379 (2011)
3. J.Q. You & F. Nori, *Nature* **474**, 589–597 (2011)



Seoul National University

LEADING THE WAY IN KOREA AND WORLDWIDE

The founding of Seoul National University (SNU) in 1946 marked the opening of the first national university in modern South Korean history. Originally, the university consisted of one graduate school and nine colleges. Today, the university has sixteen colleges, nine professional graduate schools, one graduate school, and 135 research institutes and other supporting facilities, all of which are distributed over three campuses.

Gwanak Campus, SNU's main campus, is located at the foot of the magnificent Gwanak Mountains, occupying an area of 4.8 km2. The Schools of Medicine, Nursing and Dentistry and the University Hospital are all located on the Yeongeon Campus in downtown Seoul.

SNU is indisputably the most prestigious institution of higher education in Korea. It has fostered leaders in every sector of Korean society, thereby making significant contributions to the remarkable socio-economic transformation of Korea.

Striving to be more than just the best university in Korea, SNU is making every effort to achieve its aim of becoming one of the top 20 institutions in the world by 2025.

Dr. OH Yeon-Cheon, President of Seoul National University

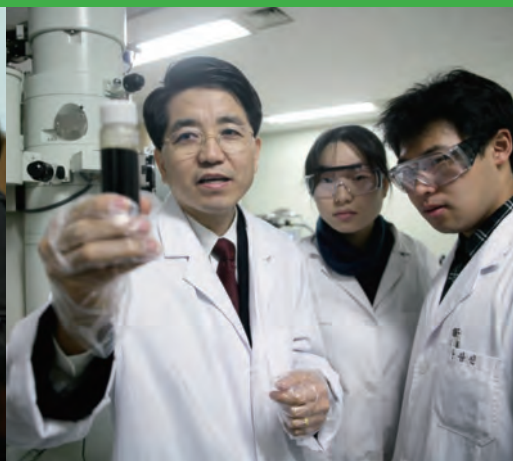
SNU Welcomes the World

The mission of SNU in the 21st century is to create a vibrant intellectual community in which students and scholars join together in building the future. The university has implemented innovative projects specifically designed to realize its globalization.

As of June of 2010, SNU has partnered with 817 institutions in 56 countries to establish a strong foundation for this, reaching out not only to renowned universities in the West but also to flagship universities in South-East Asia and the Middle East.

Its realm of influence goes beyond domestic borders. SNU is presently home to over 2,400 foreign students from 88 countries. To these students, SNU promises and delivers the finest in higher education. Efforts to globalize SNU have culminated in the recruitment of distinguished scholars from around the world. Since 2006, over 60 renowned international scholars, including Heisuke Hironaka, a famed mathematician and Fields Medal recipient, and Paul J. Crutzen, the 1995 Nobel laureate in Chemistry, joined SNU's faculty to share their knowledge and expertise. The Korean government is supporting these efforts, most notably through the World Class University (WCU) program launched in 2009. This program invites





world-renowned scholars to pursue their research and teach in Korea. SNU hired 55 scientists for this program.

Leading Research at SNU — Unlocking Secrets of the Universe

As published in the journal Science, in March 2010, SNU researchers Professor Myung Gyoon Lee Dr Hong Su Park and Ho Sung Hwang, all of the Department of Physics and Astronomy, discovered a massive-scale structure made of globular clusters in the Virgo cluster of galaxies, the existence of which was predicted a few decades ago. These globular clusters, wandering between galaxies, contain a critical clue to reveal the early history of the Universe.

One of the Top 100 Chemists Worldwide

In 2010, Professor Taeghwan Hyeon of the Department of Chemical and Biological Engineering was selected by UNESCO and IUPAC as one of the World's Top 100 Chemists (Chemistry: rank 37, Materials Science: rank 19). The ranking is based on the number of citations over the past 11 years. Professor Hyeon has also been appointed as an associate editor of the prestigious chemistry journal, the *Journal of the American Chemical Society* a. He will handle more than 400 manuscripts per year in the nanochemistry area.

Unveiling the Secrets of the Human Genome through RNA Research

Professor Narry Kim from the Department of Biological Sciences is unveiling the secrets of the human genome that cannot be unlocked solely through the long-standing DNA-centric view of biology. Her research focus is on tiny regulatory RNA molecules (microRNAs) that are important in embryo development, stem cell maintenance, and cancer formation. In recognition of her pioneering work, Professor Kim was nominated for the 2010 National Honor Scientist award and was presented with the L'Oreal-UNESCO Women in Science Award (2008) and Ho-Am Prize in Medicine (2009).

Untangling the Mysterious 4-Dimensional Space through Mathematics

Professor Jongil Park of the Department of Mathematical Sciences settled a 60-year-old conundrum in the field of mathematics by producing a completely novel concept of 4-dimensional manifolds. For his accomplishment, he was the only Korean invited to speak at the International Congress of Mathematicians (ICM), held in Hyderabad, India, in 2010. This conference is the most prestigious conference of its type. It is held in every four years under the auspices of the International Mathematical Union, the world's most distinguished mathematics union.

GENERAL INFORMATION ABOUT SNU

- Founded in 1946 as the first national university of Korea
- A comprehensive university with 16 colleges, one graduate school and nine professional graduate schools
- 3,100 full-time professors teaching 26,941 students
- Main campus and medical campus located in Seoul as the largest campus in the city, with the Graduate School of Convergence Science Technology in Suwon.

FACULTY AND STUDENTS

Full-time Faculty	3,100
Lecturers	1,319
Professors Emeriti	718
Full-time International Faculty	190
Students	
Undergraduates	16,626
Graduates	11,392
International Students	2,486

WORLD RANKINGS

- 10th in the International Professional Ranking of Higher Education Institutions by L'Ecole des Mines de Paris, 2011
- 42nd in the QS World University Rankings 2011 by Quacquarelli Symonds Limited, 2011
- 12th in the engineering field by 2010 Field Performance Ranking of Scientific Papers for World Universities by Higher Education Evaluation and the Accreditation Council of Taiwan, 2010

Statistics as of April, 2011

SEOUL NATIONAL UNIVERSITY
www.en.snu.ac.kr



Nanyang Technological University

MAKING ITS MARK

One of the world's fastest-rising universities, Nanyang Technological University (NTU) is upping the ante with an ambitious five-year plan to establish itself as a key global centre for cross-disciplinary innovation-driven research.

The energy and dynamism of Singapore is almost palpable, and there are few examples of where that is more evident than at NTU. The university's vibrancy has attracted a clutch of top-flight academics globally to join its ranks, among them is NTU's visionary president Bertil Andersson. "NTU is fast becoming a melting pot of internationally renowned scientists, promising researchers and bright young minds," said Andersson in a recent address marking the opening of a Winter School co-run by NTU's Institute of Advanced Studies and CERN, the European Organization for Nuclear Research, "contributing to putting Singapore further on the academic map."

As a principally engineering-oriented institution, NTU has always focused on research with a practical perspective, engendering a spirit of entrepreneurship and technological innovation to the work of its researchers. Now, NTU, under Andersson's leadership, is on a daring journey of reinvention, integrating new disciplines and partnerships to allow it to capitalise on the rapidly changing global research environment.

In 2011, NTU jumped 16 places to 58th position in the Quacquarelli Symonds World University Rankings, making it one of the fastest-rising universities in the global Top 100. The meteoric rise of NTU, paralleled by a remarkable many-fold increase in research article output, has attracted more than S$1.3 billion (US$1 billion) in competitive research funding from 2005 to 2011, a level matched by few institutions around the world. For Andersson, such success in securing competitive research funds represents a benchmark and a springboard for the future ambitions for the university.

"NTU has identified Five Peaks of Excellence — key areas of interdisciplinary research in which the university aims to make its mark globally by 2015," says Andersson. Those Peaks of Excellence are Sustainable Earth, Future Healthcare, New Media, the New Silk Road, and Innovation Asia — a conspicuously broad range of fields that taps NTU's existing strengths, draws in new expertise and brings them together seamlessly to achieve cross-disciplinary synergies.

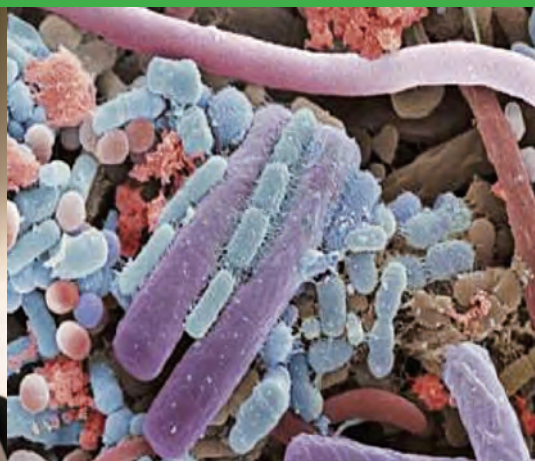
"In today's international arena," says Andersson, "there is a constant need for all researchers to keep abreast with the latest discoveries and advances. The development is very rapid actually. It is important to keep pace with new developments not just in our own field of research, but also the broader trends and perspectives in related fields beyond."

The five-year plan will transform NTU from one of the region's most reputable engineering universities into a major international participant in innovation-oriented research, driving commercial, technological and social change.

Among the raft of major changes afoot is the establishment of the Lee Kong Chian School of Medicine, a new joint medical school by NTU and Imperial College London, offering its first undergraduate programme outside the United Kingdom. With enhanced Singapore Government matching, the school has attracted initial funding of $S400 million (US$320 million). Students will have the opportunity to earn a joint Imperial College-NTU degree. The enviable partnership ushers in an important new chapter in Singapore's development as a regional and international hub for medical science and research.

Another major initiative is sustainability, which Andersson regards as the "Mount Everest" of NTU's Peaks of Excellence, and already the university has an unparalleled S$830 million (US$664 million) in funding to research under this theme. NTU's sustainability research covers fields from water, energy and earth sciences, to environmental





life sciences, engineering and disaster management, and the level of research now conducted in these fields is a match to any of the university's global peers.

Expanding the range of research

As one of the world's largest engineering colleges, NTU has considerable research depth in chemistry, materials, photonics and nanotechnology. NTU is in fact among the top three globally for research output and is the fifth most cited in the world in engineering. Photonics research, in particular, received a boost recently with articles in Nature journals on a graphene-based broadband fibre polarizer and liquid flow in an optofluidic waveguide as a new type of controllable transformation optics medium. In materials research, NTU scientists and engineers have recently published research in Nature journals on the development of a method for determining atomic-scale orbital polarization profiles, clarification of the prevalence of phase fluctuations in a superconductor, and the first ever synthesis of stable gold nanostructures with a pure hexagonal close-packed structure. Biology and biotechnology are other areas where NTU has established strength, with recent Nature articles on a biocompatible hydrogel, structural biology, chemical biology and stem cells.

Since 2008, however, the range of research conducted by NTU has expanded rapidly with the establishment of many new research centres, including the Earth Observatory of Singapore (EOS), the Singapore Centre on Environmental Life Sciences Engineering (SCELSE), the Nanyang Environment & Water Research Institute (NEWRI), the Institute for Media Innovation, the Energy Research Institute @ NTU (ERI@N), the TUM CREATE Centre for Electromobility, the NTU Solar Fuels Lab — as well as the launch of Singapore's first satellite X-SAT, co-developed by NTU and DSO National Laboratories.

Fundamental to NTU's expansion into sustainability research are the university's two national Research Centres of Excellence — the EOS and SCELSE. Earth science at NTU forms a key pillar of the university's research success with two recent articles in Nature journals on volcanism and earthquakes — fields that along with active research programmes on tsunamis and climate change contribute to NTU's disaster management directive. SCELSE explores and translates microbial biofilms into environmental solutions, maintaining a sustainable environment.

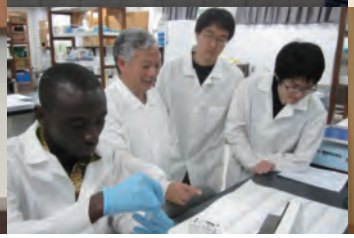
NEWRI's trans-disciplinary research on environment and water to achieve innovative and practical solutions to environmental problems brings significant economic advantages to communities throughout Asia.

Energy research at NTU is spearheaded by ERI@N, where researchers focus on improving the efficiency of energy systems and maximising the synergies of alternative energy sources through research on fuel cells, wind and tidal energy, charge storage devices, photovoltaics, microgrids and smart energy systems.

Another sustainability initiative at NTU is the recently established TUM CREATE Centre for Electromobility — a collaboration between NTU and the prestigious Technische Universität München (TUM) in Munich, Germany. The centre aims to develop innovative electric vehicle and related technologies specifically designed for challenging requirements of personal transport in Asia.

The pace of change at NTU under the university's recent initiatives is extraordinary, and undoubtedly heralds the start of an exciting new era for research in Singapore, aiming at assembling the tools needed to make its mark internationally with innovations that change the world — a goal to which Andersson is keenly attuned. "To me…there are only two kinds of research: applied research and yet-to-be-applied research." ■






Tokyo Medical and Dental University (TMDU)

A WORLD LEADER IN BASIC AND CLINICAL LIFE SCIENCE RESEARCH AND EDUCATION

Tokyo Medical and Dental University (TMDU) is proud to have been founded, in 1928, as the first national dental school in Japan. Today, TMDU is unique among medical and dental universities in having two graduate schools — one in medical and dental sciences and the other in health care sciences — and two research institutes, the Institute of Biomaterials and Bioengineering and the Medical Research Institute. Approximately 3,000 students are enrolled at TMDU and are nearly evenly split between graduate and undergraduate programs. An array of over 200 life science degree programs attracts top students from Japan and overseas. Undergraduates at TMDU study medicine, dentistry, health care sciences or oral health care sciences. They begin their career at the College of Liberal Arts and Sciences to ensure a well-rounded education. They then concentrate on a curriculum that is increasingly integrated between medical and dental sciences and utilizes an inter-professional educational approach, just as the graduate programs have traditionally enjoyed. This prepares students for the increasingly interconnected worlds of scientific research and health care. In addition, the Faculty of Medicine and the Faculty of Dentistry each have a university hospital, which further facilitate the school's educational efforts, basic and clinical research activities, and community service.

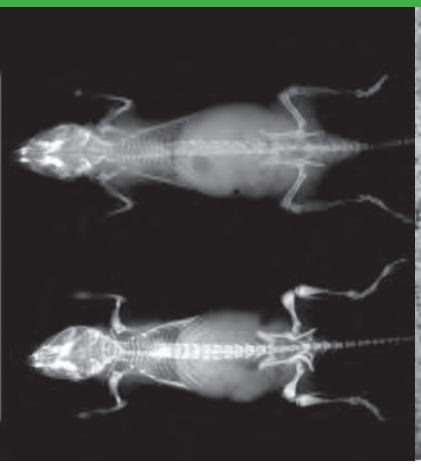
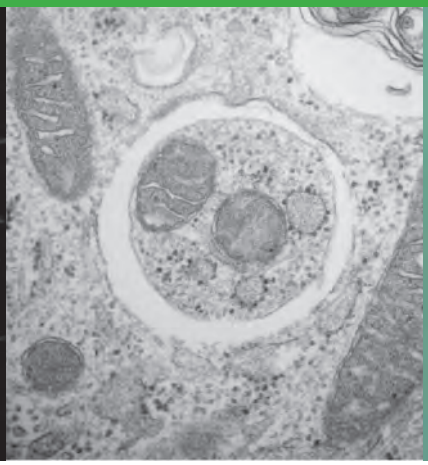
TMDU strives to produce scientists who expend every possible effort in seeking the truth, and who have the courage and ability to explore new areas, the tolerance and humility to respect diversity and accept new ideas, and the intellectual curiosity borne from a broad education. To encapsulate these goals, TMDU's mission statement is "Cultivating Professionals with Knowledge and Humanity". "Knowledge" refers to learning and techniques, and "Humanity" encompasses education and sensitivity. Medicine is driven by knowledge; humanity facilitates its implementation.

In line with our objectives of developing first-rate basic and clinical research and providing top-quality medical and dental clinical care, we have established three overseas research/education centers. The TMDU–University of Ghana Research Center for Infectious Diseases in Ghana, opened in 2009. In 2010, we opened the Latin American Collaborative Research Center for Colorectal Cancer in Chile and the Chulalongkorn University-TMDU Research and Education Collaboration Center in Thailand.

We currently have over 200 international students, who are almost exclusively enrolled in graduate studies and who primarily hail from Asia. Also, through our new tenure-track placement initiative, TMDU is recruiting outstanding young scientists from around the world for assistant professorship positions focused on medical science research.

On the domestic front, TMDU has successfully obtained many research grants, including the highly competitive Global Center of Excellence (GCOE) program for molecular science in tooth and bone diseases. This program will nurture the next generation of young researchers who will work globally on molecular science — a research field of critical importance for the future welfare of humankind and of particular importance in Japan, the world's most rapidly aging society.

To better utilize all the results produced through research activities — both within TMDU and through collaboration with industry/government — for the betterment of society, TMDU has established an organization for research and industry liaison promotion. This organization coordinates all the divisions related to research under the leadership of the trustee in charge of research. Within this framework, TMDU is establishing a center for collecting and maintaining high-quality bioresources and promoting the application of cutting-edge

medical technologies. TMDU is also playing a central role in medU-net, a networking initiative created by medical schools and aimed at accelerating industry-government-academia cooperation.

Three focal areas of research at TMDU are currently yielding important results.

Osteoimmunology

Research in the field of osteoimmunology investigates the interactions and shared mechanisms between the bone and immune systems. Under Hiroshi Takayanagi's leadership, we have focused our research on the mechanism of bone destruction in rheumatoid arthritis, especially the regulation by T cells of the osteoclast differentiation factor, RANKL. In addition to basic research on Th17 development and innate immune signaling, we have extensively studied the intracellular signaling pathways required for osteoclast development, revealing NFATc1 to be a master transcription factor. Mounting evidence suggests that immune cells, including hematopoietic stem cells and memory cells, interact with bone cells in the bone marrow to cooperatively regulate the osteoimmune system. Our lab has exquisitely demonstrated the bone function of immune molecules as well as the immune function of bone molecules by using genome-wide screening techniques and gene targeting strategies. Our studies will provide the molecular basis for novel therapeutic strategies for various immune and bone diseases including autoimmune diseases, osteoporosis and periodontal diseases.

Molecular mechanism and physiological roles of autophagy

Whole organisms and even individual cells can maintain their function and vitality by recycling their own constituents, such as proteins and organelles, and adapting to various internal and external changes. Macroautophagy, or autophagy in common parlance, is one of the major degradation pathways of a cell. During autophagy, intracellular components are sequestered by autophagosomes and then degraded upon fusion with lysosomes. Using autophagosome-indicator mice and various autophagy-deficient mice, with Noboru Mizushima at the helm, we have identified physiological functions of autophagy such as maintenance of the amino acid pool during starvation, promotion of preimplantation development as the amino acid supplying system, and quality control of cytoplasmic proteins organelles to prevent neurodegeneration and tumorigenesis. We are also investigating how autophagy is regulated and how autophagosome formation is achieved at the molecular level. We have identified a number of mammalian autophagy factors and reported that mTORC1 directly regulates an autophagy protein complex, and most autophagy factors function at a special site on or close to the endoplasmic reticulum in a hierarchical order.

Systems Approach for Musculoskeletal Development and Diseases

Compared with microarray analysis, *in situ* hybridization data provides more detailed information on the spatial regulation of gene expression and allows the identification of discrete clusters of transcribed genes. To provide new insight into the spatio-temporal distribution of individual genes implicated in whole body, under Hiroshi Asahara's direction, we created a whole-mount *in situ* hybridization (WISH) database, termed EMBRYS, containing expression data of 1,520 transcription factors and cofactors expressed in E9.5, E10.5, and E11.5 mouse embryos, which are at a highly dynamic stage of tissue and organ development. Combined with cell-based high-throughput transfection screening, we identified the critical molecular network for myogenesis: an RP58 mediated regulatory loop for muscle development. ■

Osaka University

THE NEXT GENERATION BIOMEDICAL LEADER

Without question, Osaka University has been one of the foremost leaders in the biological sciences in Japan. One after another, researchers have churned out groundbreaking discoveries in immunology, neuroscience, regenerative medicine and other life sciences. But, aside from antibody drugs, there are almost no examples in which these achievements have helped to overcome refractory diseases. Thanks to a new training program, however, Osaka University is now leading efforts to improve this situation.

The Interdisciplinary Graduate School Program for Systematic Understanding of Health and Disease will start accepting students for its inaugural class this April. Set to run for at least seven years, the program was launched under the auspices of the Japan Society for the Promotion of Science (JSPS) as a "Leading Program in Doctoral Education".Expectations are high: only programs "intended to become a driving force behind drastic reform in applicable areas of graduate school education" were selected.

The Osaka University program, led by Kiyoshi Takeda, an expert in regulatory mechanisms of innate immune response, says he will be launching a fundamental overhaul aimed at removing obstacles to progress. Specialization within the biological sciences, for example, has robbed researchers of the comprehensive perspective needed to understand disease as the breakdown of the bioregulatory system network. Even when experiments have illuminated the pathological mechanisms of disease, "thick walls" between departments have restricted the type of interdisciplinary research needed to transcend the barriers between medical engineering and pharmacology, which is essential for developing groundbreaking drugs and medical devices. Moreover, the bridges between industry, academia and the government, which are needed to realize the application of disease therapies, are lacking.

These problems are not unique to Japan, and certainly not to Osaka University, but because of the great potential of the discoveries made there, Takeda feels these obstacles keenly. Now he has a strategy to overcome them.

The starting point for his training program is the cultivation of a "bioregulatory network" of scientists who are not too specialized and can see biological phenomenon comprehensively without being trapped by their expertise in immunology, neuroscience, or regeneration. Instead, they can make the most of the functional relations between these different systems. In pursuing multidisciplinary research, the program will bring together professors from six divisions and fuse them into one teaching program.

The program will also ensure communication between engineering, pharmacology, science, dentistry and any other related fields to ensure the greatest success in producing revolutionary new ideas for medicines and medical devices. Moreover, to make sure this biological knowledge works its way into treatment of disease, the program will have representatives from the government and industry teaching alongside university professors. "The program will create people who can unleash leadership capacity in academia, business, or the public sector," says Takeda.

About 25% of the students and 10% of researchers are expected to be non-Japanese. All classes will be taught in English. "We are now negotiating with several professors at top-ranked universities of Asian countries with positive responses," says Takeda.

Takeda knows it will not happen overnight. "This will develop over a long, 10- or 20- year span," he says. "But eventually the graduates of this program will produce cutting-edge research on the global stage."

Osaka University

www.stn.osaka-u.ac.jp/english/

KAIST — The Korea Advanced Institute of Science and Technology

EDUCATION FOR THE WORLD, RESEARCH FOR THE FUTURE

World-Class Education

Founded in 1971 by the Korean government, KAIST has been the catalyst for advanced science and technological innovation in Korea. In addition to its well-regarded national reputation, KAIST has won global recognition, and been placed consistently within the top 100 universities in the world by The Times Higher Education and Quacquarelli Symonds world university rankings.

More than 10,000 domestic and international students are studying at KAIST under generous scholarships. All courses and seminars are taught in English. A recent educational initiative, the 'I-Four Plan', (Internationalized, IT-based, Independent, and Integrated) facilitates more interaction between students and over 1,000 faculty members through advanced communication and information technology. The I-Four Plan provides students with opportunities to take courses with renowned professors from Korea and other countries, thereby promoting greater collaboration in education and research.

Research for a Better Tomorrow

KAIST recently shifted from a conventional research paradigm that emphasizes empirical, discipline-specific studies to one that strengthens knowledge convergence and cross-disciplinary research. KAIST Institute (KI) conducts interdisciplinary research in eight areas such as bioengineering, IT convergence, nano-technology, eco-energy, and urban space and systems.

KAIST is also addressing the important issues facing humanity in the 21st century. Two major innovative technological systems, for example, have evolved from the concept stage to actual operations: KAIST's On-Line Electric Vehicle is a public transport system powered by electromagnetic induction, and its Mobile Harbor circumvents the need for ships to berth at shore-bound harbors.

With research funding totaling US$255 million in 2011, members of the KAIST community maintained their stellar reputation, received prestigious recognition, and published several important papers, including:

- Ryong Ryoo's research on new zeolites that was selected as one of the "10 Breakthroughs of the Year, 2011" by *Science*, December 2011
- Chan-Ho Yang's research on room temperature magnetoelectric applications (*Nature Communications*, November 29, 2011)
- Jeong Young Park's work on nanoscale friction and adhesion on Pt colloid nanoparticles (*Langmuir*, American Chemical Society, February 2, 2011)
- Hee-Tae Jung's direct visualization of large-area grapheme domains and boundaries by optical birefringency (*Nature Nanotechnology*, Published online November 20, 2011)
- Eun-Joon Kim and Chang-Won Kang's discovery of GIT1 association with ADHD (*Nature Medicine*, Published online April 17, 2011)

Increasing global outreach and partnership programs continue to attract talented young researchers to study and work at KAIST. With growing facilities, and strong ties to industry and business, KAIST has driven entrepreneurship and spawned many technology startups and innovative ventures.

Hub of Innovation

With KAIST at its heart, the Daedeok Innopolis is home to Korea's explosive R&D and business communities, surrounded by more than 1,000 public and private research institutes and venture companies. KAIST will continue to exert its critically important influence on the advancement of science and technology in the region, Korea, and the world.

KAIST envisages that it will soon become one of the world's top universities and will continue to create a dynamic platform for education and research that has made it a global hub of technological innovation. KAIST invites future leaders in science and technology who are intellectually ambitious to broaden their horizons and expand the range of possibilities by reaching their full potential through unlimited and unbound imagination. ■

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National Institute of Informatics, Japan

WEAVING INFORMATION INTO KNOWLEDGE — CREATING FUTURE VALUE THROUGH INFORMATICS

As Japan's only academic research institution aspiring to create future value through informatics, the National Institute of Informatics (NII) is seeking to advance integrated research and development activities in information-related fields. This includes not only computer science and information technology but also human, social and life sciences. The NII creates and provides state-of-the-art academic–information infrastructure, including networks and content, which is essential to research and education within the broader academic community. The NII focuses on partnerships with universities and research institutions throughout Japan, as well as with industry and other organizations. The NII also actively encourages international exchange with overseas universities and research institutions, including interactions between researchers via joint research projects and graduate student interaction.

Funding Program for World-Leading Innovating R&D on Science and Technology

The Funding Program for World-Leading Innovating R&D on Science and Technology (FIRST Program) is a research funding policy of the Japanese government. This program places high priority on an operational support structure that allows core researchers to appoint an institution of their choice to support their research. The aim of the FIRST Program is to advance world-leading research and development, which will strengthen Japan's international competitiveness over the medium to long term, by producing and applying results that contribute to society and public welfare. Two projects proposed by the NII have been adopted under the program with the ambition to lead the world with technologies originating in Japan. The first is a project for pioneering the development of quantum computers and quantum simulators, seen as next-generation computer. The second is aimed at developing the world's fastest database software, enabling high-speed analysis of large-scale databases to support the effective use of massive data generated in the current era of data explosion.

The NII Shonan Meetings

The NII Shonan Meetings promote informatics and associated research at the international level. They follow the style of the Dagstuhl Seminars in Germany, the world's premier seminars on informatics. Participants stay at the Shonan Village Center near Tokyo, free from the distractions of regular life. The meetings typically have no fixed programs, and participants are not required to submit a paper or make a presentation. Instead, the topics and programs evolve from the participants' discussions. The meetings provide a place where world-class scientists and promising young researchers can share their knowledge, discuss their research findings, and explore cutting-edge topics in the field of informatics. The NII expects the meetings to provide a further boost to informatics research.

Since their launch in February 2011, eight NII Shonan Meetings have been held and received positive feedback.

Recent Topics of the NII Shonan Meetings:

1. Graph Algorithm and Combinatorial Optimization Feb. 13–18, 2011, 39 participants
2. The 14th Agda Implementors Meeting [Organized by Y. Kinoshita Sept. 8–14, 2011, 19 participants
3. Dependently Typed Programming Sept. 13–17, 2011, 29 participants
4. Knowledge-Leveraged Computational Thinking through Natural Language Processing and Statistical Logic Sept. 18–21, 2011, 20 participants
5. Automated Techniques for Higher-Order Program Verification Sept. 22–27, 2011, 25 participants
6. Hybrid Quantum Devices Nov. 5–9, 2011, 24 participants
7. International Symposium on Symbolic Systems Biology (ISSSB'11) Nov. 13–17, 2011, 31 participants
8. Large-Scale Distributed Computation Jan. 11–16, 2012, 32 participants

Inter-University Research Institute Corporation / Research Organization of Information and Systems
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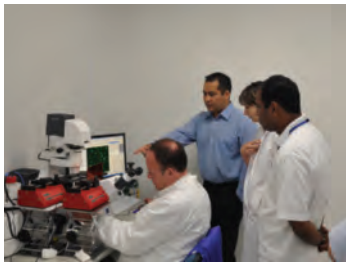

WPI-Advanced Institute for Materials Research

ADVANCING MATERIALS TO BUILD A BETTER FUTURE

Motoko Kotani

Director, from April 2012

Mathematician; leader of interdisciplinary research in Japan between mathematics and materials science.

WPI-AIMR's top-class international researchers are adding new dimensions to the burgeoning field of materials science, as well as developing innovative functional materials and devices. The interdisciplinary research vigorously conducted there is based on atomic and molecular control. WPI-AIMR was established at Tohoku University in 2007 under the Japanese Ministry of Education, Culture, Sports, Science and Technology(MEXT)'s World Premier International Research Center Initiative (WPI).

WPI-AIMR Research Groups

Bulk Metallic Glasses (BMG)

The Bulk Metallic Glasses Group is dedicated to cutting-edge research on advanced, non-equilibrium, metallic materials. This includes amorphous and nanostructured metals and alloys that exhibit unique and superior physical, chemical and mechanical properties.

Materials Physics

Exploring and understanding innovative materials for electronic devices are the key goals of the Materials Physics Group. Both inorganic and organic materials are investigated using a variety of approaches.

Soft Materials

Key research topics of the Soft Materials Group include synthesis, characterization and evaluation of soft materials, such as organo-π-electronic devices, gel, polymer composites, microporous polymer films and nano-structured materials catalysts.

Device / System

Laboratories in the Device/System Group research spintronics, electronics, MEMS and bio devices. The group is striving to fabricate innovative materials and develop them to into novel devices.

Mathematics Unit

Based on the power of mathematics which provides a common language to all scientific fields, the Mathematics Unit accelerates interdisciplinary research in materials science.

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WPI·AIMR