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Initial Responses to the Great East Japan Earthquake by the Academic Community in the United States

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The Great East Japan Earthquake and the subsequent nuclear power plant accidents had great impact not only on Japan but also on countries around the world. The academic community in the United States has taken a variety of actions, including making both long-term proposals for policymaking and urgent proposals to provide information to researchers and the public as well as advice and assistance on national policymaking related to disasters and accidents. Many academic organizations have provided information through their websites. In particular, large academic organizations and organizations specializing in earthquakes and nuclear plant accidents have provided on-site reports and other information and have conducted scientific analyses.

Some websites have provided information not only to researchers but also to the general public. For example, the American Association for the Advancement of Science (AAAS) has published news articles about the earthquake and nuclear plant accidents in *Science*, and medical organizations such as the American Society for Radiation Oncology (ASTRO) and the American Academy of Pediatrics have provided radiation-related information to educate the American public. In the United States, academic organizations usually provide information to the public as well as offer advice and make proposals to related organizations and the government. The American Nuclear Society (ANS) announced that it would support the Atomic Energy Society of Japan (AESJ) and the United States government. Out of concern for conflicting information and misleading media reports, ANS also asked the government to withhold policy decisions concerning nuclear power. In some cases, the academic community has also proposed solutions to scientific and technological problems facing the Japanese government, Tokyo Electric Power Company (TEPCO), and the United States government. In addition, during congressional hearings on the accidents at the Fukushima Daiichi nuclear power plant, testimony was heard not only from the Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE) but also from the academic community, which holds a different point of view from government organizations.

It should also be noted that the academic community in the United States exists in a different environment than the Japanese academic community. For example, American academic organizations have strong management bases, the earthquake and the nuclear power plant accidents have been taken very seriously even though they occurred in another country, and many different kinds of information were distributed quickly through the Internet following the disasters.

The American example suggests that academic communities can play four roles in regard to disasters and accidents: sharing of information, providing assistance to people, contributing to policy making, and swiftly conducting academic research.

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Initial Responses to the Great East Japan Earthquake by the Academic Community in the United States

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1 Introduction

In response to the magnitude 9 earthquake and tsunami that struck east Japan on March 11, 2011 and the subsequent nuclear power plant accidents resulting from the earthquake and tsunami, academic communities both in Japan and abroad responded in various ways. This article describes the initial actions the academic community in the United States took, in particular from the researchers' point of view, in response to the disaster and accidents that took place in another country (Japan). Specifically, based on information on websites and other media, this article looks at those activities that occurred in the first two months or so following the earthquake and accidents.

Incidentally, the United States Armed Forces, the Federal Emergency Management Agency (FEMA), the Nuclear Regulatory Commission (NRC), Department of Energy (DOE), and other government organizations have been working with the Japanese government to respond to the earthquake, the tsunami, and the accidents at the Fukushima Daiichi nuclear power plant. There may have been cases where academic organizations and individual researchers were involved directly or indirectly in these governmental activities, but this article does not aim to examine such activities.

2 What This Article Covers

2-1 Academic Community in the United States and the Outline of Their Responses

This article targets the academic community, particularly organizations referred to as academic societies and associations. These academic organizations in the United States are not acknowledged by the government, unlike, for example, the Science Council of Japan's cooperating

academic research organizations. This article selected organizations whose presidents are the member of the Council of Scientific Society Presidents as well as organizations whose presidents are not included in the council but which covers the fields of earthquakes, tsunamis, nuclear energy, radiology, and other fields related to the recent earthquake and nuclear power plant accidents and which have participating researchers from universities and public research institutions.

Some 62 organizations make up of the Council of Scientific Society Presidents, and among them, 20 organizations (about one third) published information about the Great East Japan Earthquake and the accidents at the Fukushima Daiichi nuclear power plant. This figure is only limited to certain organizations, and so, it may not reflect trends for all academic organizations in the United States. However, one can say that a certain number of organizations clearly expressed their interests. More specifically, six organizations expressed their concerns and support for the Japanese people and the academic community in Japan; 15 organizations provided information to their members; and three organizations provided information to the public. In addition, the American Nuclear Society made proposals to policy makers, and the Health Physics Society announced that it would hold a special session at an academic conference. Some organizations published information more than once, and so the total number of cases where information was published is more than 20 (the number of the organizations which published information).

In the United States, some academic organizations have purposes and missions that are not directly related to academic research even though their core value is the advancement of academic research. For example, the Union of Concerned Scientists is one such organization and aims to build an

environmentally healthy and safe world. This article covers organizations that are not normally considered academic organizations by the Japanese standard if researchers participate in the organizations. Incidentally, many universities (research institutes) and non-profit research institutions actively provided information on the earthquake and the nuclear power plant accidents. The MIT NSE Nuclear Information Hub and several seismology and earthquake engineering centers that were established with the support of the National Science Foundation (NSF) were among them. However, this article does not aim to introduce actual research and so does not include these activities.

2-2 Methods of Identifying Information

The academic community in the United States responded to the earthquake and nuclear power plant accidents in different ways. This article categorized their activities into four groups: 1) the expressions of concerns and support for the Japanese people and Japanese researchers, 2) provision of information to researchers and the general public, 3) advice and assistance for national policy making, and 4) the development of academic research related to the earthquake and nuclear power plant accidents.

The main method of identifying information was to access information on each organization's website. During the process, relevant Web pages were narrowed down by using search engines on each website and Google's site search to search for keywords such as "Japan," "nuclear," "earthquake," "tsunami," and "Fukushima." This article does not cover Web pages that are restricted to members only or have other types of access restriction, with the exception of some academic articles. Some relevant Web pages might not have been identified if academic organizations had set up the pages on different sites and had not included links on the original websites. This survey was conducted roughly between the one- and two-month anniversaries of the earthquake and the accidents. Some information might have been posted temporarily right after the earthquake and then eliminated, and some information might be revised or eliminated by the time this review is published.

Due to the methods used in this article, statistical reliability may not be high. However, the purpose of this article is to understand the action taken by the academic community in the United States right

after the earthquake, and so I believe that a sufficient amount of information was acquired.

3 Expressions of Concerns and Support for the Japanese People and Researchers

Firstly, many academic organizations in the United States expressed concern for the Japanese people and researchers who are members of their related academic organizations in Japan, expressed their condolences for the victims, and expressed their determination to give support by way of, for example, fundraising. The forms and content varied, but they can be roughly categorized into: 1) expressions of concern and condolence to the victims, 2) expressions of concern for researchers who are members of related academic organizations in Japan, 3) fundraising (to be conducted by each academic organization), and 4) fundraising through the Red Cross and other organizations.

One could find, on many organizations' websites, these expressions of condolence for the victims and concern for researchers who are members of their related academic organizations. For example, among the organizations in the Council of Scientific Society Presidents, condolences and concern were expressed by the American Chemical Society, the American Crystallographic Association, Inc., the American Nuclear Society, the American Psychological Association, the Society for Neuroscience, and SPIE (the international society for optics and photonics); the president of the IEEE (Institute of Electrical and Electronics Engineers) posted a message for the members in Japan on its website; and seven out of the 38 member societies expressed their concern on their websites. Additionally, some organizations asked their American members to donate to the Red Cross and other organizations in their statements to express concern or to report on the conditions. The American Nuclear Society set up its own Japan Relief Fund and began accepting donations.

4 Provision of Information to Researchers and the American Public

Many academic organizations have provided information on their websites. The American

Association for the Advancement of Science (AAAS) published news articles about the earthquake and nuclear power plant accidents on its journal *Science* (both printed and electronic versions) for the subscribers (AAAS members). Some organizations provided information on their websites by publishing related articles in their periodic newsletters or creating special pages on the earthquake and the accidents. The content also varied. Some organizations announced their official opinions and others let their members write their opinions freely in a blog style.

In addition, some academic organizations reprinted information from the Japanese, the American, and other countries' media as well as from related Japanese and American public organizations and electric power companies.

The information was mainly targeted at the members and experts. However, some organizations provided information to the general public, who do not have specialized knowledge. The following sections separately describe two types of information: information provided to the public with an aim to better educate them and information provided to researchers.

4-1 Provision of Information to Researchers

4-1-1 Science

The Great East Japan Earthquake and the accidents at the Fukushima Daiichi nuclear power plant were significant occurrences also in scientific and technological points of view. Both *Science* (published by the AAAS) and *Nature* (a commercial journal published in the United Kingdom) published articles on the disasters. Table 1 illustrates the titles and outlines of published articles (including short news notes) in *Science* between the occurrence of the earthquake and the May 20 edition.

Table 1 shows articles from the printed version of *Science*. *Science Express* (publication ahead of print) also published and updated academic reports on the earthquake. *ScienceInsider* (online news and analysis) also updated information in a section titled "Japan Earthquake: The Aftermath."

4-1-2 IEEE Spectrum

The IEEE (Institute of Electrical and Electronics Engineers) featured articles titled "Japan's March 11th Earthquake and Nuclear Emergency" on its newsletter, *Spectrum*. *Spectrum* is a monthly newsletter in print

form, and its online edition provides more information using blogs and other tools. All relevant articles, including the blog entries about the earthquake and nuclear power plant accidents, are put together into the feature page, "Japan's March 11th Earthquake and Nuclear Emergency." The articles are categorized into "Most Recent," "Commentary," "Infrastructure," "Search and Rescue Robots," "Earthquake and Tsunami Warning Systems," "From the Archive," and "Time-line of official TEPCO and IAEA announcements."

The "Most Recent," a blog-style page, posted a total of 70 byline articles by May 24. Those who are associated with IEEE as well as contributing authors who have contracts with IEEE wrote most of the articles. The content varied widely: 39 reports based on information coming from related organizations and the media in Japan and elsewhere; 12 research analyses and explanations conducted by the IEEE on the accidents; 4 technological reports and analyses related to the earthquake and the nuclear power plant accidents (for example, on robots); 10 commentaries that include personal opinions and interpretations; four interview articles; and an article posted by a Japanese researcher. The contributing authors in Japan who had contracts with IEEE often posted articles based on information from related organizations, the Japanese media and elsewhere. They acquired information from a wide variety of organizations and individuals, including TEPCO, government organizations, companies, and university researchers. IEEE also published its own research analyses and explanations on the nuclear power plant accidents. As to the technological reports and analyses in relation to the earthquake and the nuclear power plant accidents, *Spectrum* has been reporting on the use of disaster-relief robots, the attempts by an Air Force drone to acquire images of the reactors, and the functions of disaster-relief robots. The IEEE reviewed the use and the functions of such robots but did not suggest any actual robot names. In contrast, the Association for Unmanned Vehicle Systems International (AUVSI) selected and sent robots to Japan. This example illustrates a stance of an industrial organization, which is different from academic organizations. Individual opinions and comments published under "Most Recent" sometimes included sharp criticisms as contributors' personal views. However, the blog platform made it possible to publish opinions that are

Table 1: Articles from *Science* (March 18 through May 20, 2011)

Article titles	Outline
March 18 edition	
Devastating Earthquake Defied Expectations (vol.331, pp1375-1376)	Explains the mechanism of the Great East Japan Earthquake and how it was beyond expectation.
Waves of Destruction (vol.331 p1376)	Reports on the tsunami and damage.
March 25 edition	
Devastation in Japan: Nuclear Power's Global Fallout (vol.331, pp1502–1503)	Illustrates a world map that provides the locations of nuclear power plants in relation to seismic hazard zones.
Radiation Risks Outlined by Bombs, Weapons Work, and Accidents (vol.331 pp1504–1505)	Reports on radiation exposures after the Hiroshima-Nagasaki atomic bombs, the accident on Three Mile Island, the accident in Chernobyl, etc.
Candidate Radiation Drugs Inch Forward (vol.331, p1505)	Explains the difficulty in developing effective drugs for radiation exposures. The photo in the article shows the reactor building of the Fukushima Daiichi nuclear power plant after the building had a hydrogen explosion. The end of the article suggests that the accidents could accelerate the development of radioprotectants.
Current Design Address Safety Problems in Fukushima Reactor (Vol. 331 p. 1506)	Explains designs and functions of the reactors.
Fukushima Cleanup Will Be Drawn Out and Costly (vol.331, p1507)	Reports on the disposal of radioactive material at the Fukushima Daiichi nuclear power plant.
Japan's Research Facilities Down But Not Out (vol.331, p1509)	Reports on the impact of the Great East Japan Earthquake on research facilities and research activities in Japan. Reports on university management (Tohoku University), the Japan Proton Accelerator Research Complex (J-PARC), High Energy Accelerator Research Organization (KEK), and Chikyu (a deep-sea drilling vessel).
April 1 edition	
When Science and the Media Mix (vol.332, p13)	Refers to the Great East Japan Earthquake and the accidents at the Fukushima Daiichi nuclear power plant at the beginning of the article and explains the importance of communication between scientists and the media.
Scientific Consensus on Great Quake Came Too Late (vol.332, p22–23)	Explains that knowledge about the Jogan earthquake in 869 C.E. did not influence risk assessment policies, and comments on risk assessments of earthquake-induced tsunamis in Japan and elsewhere.
Pool at Stricken Reactor #4 holds Answers to Key Safety Questions (vol.332, pp24–25)	Reports on the problematic spent fuel storage pool for reactor #4 at the Fukushima Daiichi nuclear power plant.
April 8 edition	
Nuclear Crisis Drags On (vol.332, p154)	Reports on the leakage of water contaminated with radioactive material.
April 15 edition	
Japan Widens Evacuation Zone (vol.332, p288)	Reports on the expansion of the evacuation zone and the government's announcement to raise its rating on the International Nuclear and Radiological Event Scale to seven.
By the Numbers: 37.9 (vol.332, p290)	A short news lines about the highest height of the tsunami examined by an investigating team.
Fukushima Radiation Creates Unique Test of Marine Life's Hardiness (vol.332, p292)	Presents a view that one should not overreact about eating fish in relation to radioactive material leaked from the Fukushima Daiichi nuclear power plant into the ocean. Reports on interests in biological research for the impact of radioactive material on marine species.
April 22 edition	
Nuclear Cleanup to Take Months (vol. 332, p402)	Reports on the nuclear cleanup plans announced by the Tokyo Electric Power Co.
April 29 edition	
U.S. Scientists Map First-Year Radiation Risks (vol.332, p518)	Reports on the risk analysis (conducted by the DOE) over the next year on people living near the Fukushima Daiichi nuclear power plant.

Nuclear Power Stalls in Italy (vol.332, p519)	Reports on Italy's postponement of its nuclear power programs in response to the accidents in Japan.
May 6 edition	
Radiation Standards Draw Protests (vol. 332, p647)	Reports on the resignation of Toshiso Kosako (Professor at the University of Tokyo) as Special Advisor to the Cabinet.
May 13 edition	
Japan Scraps Nuclear Plan (vol.332, p773)	Reports on the announcement of reexamining Japan's energy plans by Prime Minister Kan.
May 20 edition	
Ethics Commission Calls For Swift Nuclear Phase-out (vol.332, p900)	Reports on a leaked draft of a report drawn up by the Ethics Commission on Safe Energy Supply in Germany. The draft includes shutting down of some nuclear power plants in the country.
Fukushima Revives The Low-Dose Debate (vol.332, pp908–910)	Reports on the debate in Fukushima prefecture over allowable levels of radiation, which have come down after the nuclear power plant accidents.
Schoolyard Radiation Policy Brings a Backlash (vol.332, p909)	Reports on the guidelines from the Ministry of Education, Culture, Sports, Science and Technology on allowable radiological contamination in schoolyards and responses to the guidelines from experts and the public.
Crippled Reactors to Get Cooled and Wrapped (vol.332, p910)	Reports on the cooling systems of the Fukushima Daiichi nuclear power plant.
New Work Reinforces Megaquake's Harsh Lessons in Geoscience (vol.332, p911)	Reports on research issues on the mechanism of earthquakes.
Seismic Crystal Ball Proving Mostly Cloudy Around the World (vol.332, pp912–913)	Reports on the trends in earthquake forecasting and the effect of the Great East Japan Earthquake on earthquake forecasting.

different from the official views of the organization. The interview articles included interviews with university teachers and former employees of TEPCO. In the "Commentary" section, four different authors published commentaries. The titles were "Japan Nuclear Accident: Worse than the Worst, Again" (March 12), "Japan's Nuclear Emergency and the Future of Nuclear Power" (March 14), "The Scientific Estate: Bringing the Meltdown Back Home (or) Buddy, Can You Spare an iPad2?" (March 14), and "The Continuing Evolution of Nuclear Power" (March 29). One can understand that the commentaries were written from a wide range of perspectives.

The "Infrastructure," "Search and Rescue Robots," and "Earthquake and Tsunami Warning Systems" also have several reports and explanations on technological and other issues.

4-1-3 Other Academic Organizations in Fields Related to Earthquakes and Nuclear Power Plant Accidents

Academic organizations in fields related to earthquakes and nuclear power plant accidents (for example, geophysics and nuclear power engineering) actively reported, on their websites, on Japan's natural and nuclear disasters, citing news from the media and

adding their own analyses.

The ASME (American Society of Mechanical Engineers) published articles in the "News and Articles" section on its website. The titles included "Earthquake Leaves Japan in Crisis," "Rescue Robots Aid Japanese Recovery," "Rebuilding Japan's Railway System," "Tsunami Forces Debate over Vertical Evacuation," "Manufacturing Tested by Japan Earthquake," and "Chernobyl 25 Years Later."

The Seismological Society of America (SSA) has, on the homepage of its website, a link to its Facebook page, where academic and technological reports are posted. During the first month or so after the earthquake, more than 30 articles on the Great East Japan Earthquake were posted. After that, the number of articles on the earthquake decreased, but articles on earthquake prediction and other topics influenced by the earthquake have continued to be posted.

The American Physical Society (APS) published an article about the accidents at the Fukushima Daiichi nuclear power plant by Professor Emeritus David W. Hafemeister from the California Polytechnic State University in the April 2011 newsletter for the Forum on Physics and Society (FPS), one of the many forums of the APS.

The American Nuclear Society provides information

on its website via blog entries and other methods. The following section (4-2. Provision of information to better educate the general public) introduces the ANS “Nuclear Café” blog in detail. The “Nuclear News” in the April newsletter had an 8-page feature article on the Fukushima Daiichi nuclear power plant and reported on the details of the accidents.

To reflect the organization’s purpose to use scientific knowledge to develop policies for the creation of a healthy environment and a safer world, the Union of Concerned Scientists set up the “Nuclear Reactor Crisis in Japan” page and posted blog entries (under “All Things Nuclear”), FAQs, briefings to the press, and other information.

4-2 Provision of Information to Better Educate the General Public

In addition to the aforementioned information for researchers, academic organizations also provided information on their websites for the general public, who do not have specialized knowledge.

The American Society for Radiation Oncology had a link on its website’s homepage to a three-page article “Radiation Issues Related to the Japan Incident” for the general public. The society also had a link to a related article from the Houston Chronicle.

The American Academy of Pediatrics has a link on its website’s homepage to “Children’s Health Topics,” where one could go to the “Children and Disaster” page. One of the topics was “Japan Earthquakes and Nuclear Crisis,” which includes information on travel to Japan (the United States Department of State urges U.S. citizens to defer travel to Japan), safety in the United States (there is no health risk for radiation exposure to U.S. residents), and links to federal government organizations (the Department of State, the FDA, FEMA, the CDC, the EPA, the NRC, etc.).

The Health Physics Society has the “Fukushima Nuclear Plant Update” page for its members and the “Ask the Experts—Questions and Answers” page for the general public. On this page, one could find updated answers and questions related to the Fukushima Daiichi nuclear power plant accidents.

The American Psychological Association did not provide related information on its website, but in its newsletter on the Web (“Monitor on Psychology”), the association mentioned that it provided support to those who were, due to the earthquake and subsequent situations, psychologically affected in Japan and the

United States.

The “ANS Nuclear Cafe: All Things Nuclear” page managed by the American Nuclear Society set up a page dedicated to the nuclear issues under the title “Fukushima.” The page introduces websites of public organizations and the media (both in Japan and the United States) that have released relevant announcements and news. In addition, after March 15, blog entries were updated almost every day (twice a day at first) to keep readers up-to-date on the situation in Japan. The page also kept records of responses to the media made by those who are associated with the society, introduced the Student Section’s activities, explained MOX fuel, and posted radiation-related questions and answers.

The Union of Concerned Scientists set up the “Nuclear Reactor Crisis in Japan FAQs” page. It explains, in an easy-to-understand manner, the uptake of radioactive materials, the meaning of “meltdown,” cooling issues, and possible health impacts, and provides information on the evacuation area. It also included reasons for the Japanese government’s decisions.

5 | Advice and Support for National Policy Making

As discussed earlier, this article does not intend to cover the United States government’s responses to the earthquake and the nuclear power plant accidents. In addition, the academic organizations usually do not get directly involved in responses to emergency situations taken by the armed forces, FEMA, the NRC, etc. However, there are cases where academic organizations provide advice and suggestions regarding specific policy themes and where academic organizations conduct research and draw up proposals to support long-term policy making.

The United States is not a parliamentary system. Congress makes policies, being independent from the executive branch that the President presides over. At congressional hearings during this policy-making process, academic organizations may get involved. In particular, after the nuclear power plant accidents in Japan, many hearings were held for committees in both the Senate and the House of Representatives, and not only the legislative branch but also the academic community provided testimonies.

5-1 *Proposals to the Japanese and American Governments and Other Related Organizations*

Advice and support provided by academic organizations are illustrated below. They are categorized into 1) proposals, 2) reports, and 3) testimonies.

5-1-1 Policy, Scientific, and Technological Proposals

Firstly, some policy proposals were made to the executive branch. For example, Mr. Joe F. Colvin, President of the American Nuclear Society, sent a letter to President Barack Obama to announce the intention to assist the Atomic Energy Society of Japan and the United States government. In the letter, Mr. Colvin also mentioned that “events at the Fukushima Daiichi reactor site continued to evolve rapidly” and that there were “conflicting information and, in some cases, misleading media reports.” He urged “policymakers in the administration and Congress to withhold judgments on U.S. nuclear policy until the current situation [had] been resolved and the incident [had] been fully understood.”

The Federation of American Scientists (FAS) has links, on its “Nuclear Crisis in Japan” Web page, to the Mr. Colvin’s articles published in the media (including the Japanese media). Through these articles, the Mr. Colvin voiced his opinion in March to promote the use of renewable energy. Some of these articles are: “OPINION: Future of nuclear power in Japan: advice from American friend” (Kyodo News Service, March 15) and “Do not phase out nuclear power—yet” (Nature [online version], March 23, 2011).

5-1-2 Posting Previous Reports on the Web and Publishing a New Report by Adding Information during the Printing Process

As I write this article, no concrete policy proposals have been published regarding the recent earthquake and nuclear accidents. Some organizations, however, have republished previous reports or added information during the printing process in order to support the administration.

The National Academies (National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council) were established to “provide expert advice on some of the most pressing challenges facing the nation and the world” to the executive and legislative branches. The Academies did not necessarily respond to the

situations right away but rather provided on their website information that was considered useful, judging on past activities. For example, on March 17, the Academies posted their previous reports on the homepage under the title “Japan’s Nuclear Crisis” and made them easily accessible to general public. These reports are on nuclear fuel storage, low-level radiation, nuclear accidents, etc. In the past, the Academies have established blue ribbon panels to respond to large-scale disasters in the United States and published reports that have greatly contributed to policy making. After Hurricane Katrina, for example, the Academies drew up and submitted many disaster response and other reports to related organizations. If the Academies recognize this earthquake and the subsequent nuclear accidents to be profoundly related to the United States, it may take similar responses in the future.

The American Academy of Arts & Sciences had a link “Japan Nuclear Power Crisis” on the top page and, on the linked page, published a report titled “Nuclear Reactors: Generation to Generation.” Incidentally, the report was already in the process of being printed at the time of the accidents at Fukushima Daiichi Nuclear Power Plant, but information about the accidents was added.

The Union of Concerned Scientists introduced its previous reports, such as “The NRC and Nuclear Power Plant Safety in 2010: A Brighter Spotlight Needed” and “Nuclear Power: Still Not Viable without Subsidies” by posting them on the website.

5-2 *Testimony at Congressional Hearings*

It is common for witnesses for congressional hearings to be selected in such a way that allows for opinions from different perspectives to be presented, so that the testimony will be useful in discussions for policy making. Not only government agencies such as the NRC and the DOE but also some academic organizations testified at congressional hearings about this particular earthquake, the nuclear power plant accidents, and related energy policies. For example, at the hearing on “The U.S. Government Response to the Nuclear Power Plant Incident in Japan” held on April 6, the NRC, the Nuclear Energy industry, and scientist organizations testified. One scientist testified from the perspectives of environmental and safety issues and another scientist testified as a representative of a nuclear energy society.

Table 2 illustrates the list of congressional hearings

on the earthquake and nuclear power plant accidents during a roughly two-month period. For this article, underlining has been added to indicate the testimony of academic organizations.

During this period, congressional hearings were taking place before the appropriation and other committees in response to the “President’s Budget” in February. Some academic organizations, while calling attention to the significance of related research, mentioned the Great East Japan Earthquake and the accidents at the Fukushima Daiichi nuclear power plant, indicating the importance of extending the related budget. However, this report does not cover congressional hearings that are directly related to the appropriations.

6 Academic Research in Earthquake and Nuclear Accident-related Fields

Immediately following the recent earthquake and nuclear power plant accidents, academic research on them has been actively conducted not only in the United States, but around the world. Special sessions were held in some academic conferences and papers including preprint versions were published on the Web.

The Seismological Society of America added a session on the Great East Japan Earthquake and the Christchurch Earthquake at its annual meeting, held between April 13 and 15, 2011. The deadline for new

Table 2: Testimony of Academic Organizations at Senate Hearings (Underlines indicate testimony by persons from academic community.)

Date	Committee	Hearing	Witness/Speaker
March 16	Committee on Environment and Public Works	Nuclear Plant Crisis in Japan and Implications for the United States	Gregory B. Jaczko, Chairman, Nuclear Regulatory Commission Anthony Pietrangelo, Sr. Vice President and Chief Nuclear Officer at the Nuclear Energy Institute Edwin Lyman, Senior Scientist for Global Security at the Union of Concerned Scientists (Note: They spoke as speakers, not as witnesses.)
March 29	Committee on Energy and Natural Resources	To provide an update on the recent events at the Tokyo Electric Power Company’s Fukushima Daiichi reactor complex due to the earthquake and tsunami that occurred on March 11	Peter Lyons, Acting Assistant Secretary, Office of Nuclear Energy, U.S. Department of Energy; Bill Borchardt, Executive Director for Operations, Nuclear Regulatory Commission David Lochbaum, Director, Nuclear Power Project, Union of Concerned Scientists Anthony R. Pietrangelo, Senior Vice President and Chief Nuclear Officer, Nuclear Energy Institute
March 30	Energy and Water Development Subcommittee, Committee on Appropriations	Hearing on Nuclear Safety	Peter B. Lyons, Acting Assistant Secretary for Nuclear Energy, U.S. Department of Energy Ernest J. Moniz, Professor of Physics, Massachusetts Institute of Technology David Lochbaum, Director, Nuclear Safety Project, Union of Concerned Scientists William Levis, President and COO, PSEG Power Gregory B. Jaczko, Chairman, Nuclear Regulatory Commission
April 12	Committee on Environment and Public Works	Review of the Nuclear Emergency in Japan and Implications for the U.S.	Lisa Jackson, Administrator, U.S. Environmental Protection Agency Gregory B. Jaczko, Chairman, Nuclear Regulatory Commission Sam Blakeslee, State Senator, California’s 15th District James D. Boyd, Vice Chair, California Energy Commission Lewis D. Schiliro, Cabinet Secretary, Delaware Department of Safety & Homeland Security Curtis Sommerhoff, Director, Miami-Dade County Department of Emergency Management Charles G. Pardee, Chief Operating Officer, Exelon Generation Thomas B. Cochran, Senior Scientist, Nuclear Program, Natural Resources Defense Council

May 5	Committee on Homeland Security & Governmental Affairs	Understanding the Power of Social Media as a Communications Tool in the Aftermath of Disasters	W. Craig Fugate, Administrator, Federal Emergency Management Agency, U.S. Department of Homeland Security Renee Preslar, Public Information Officer, Arkansas Department of Emergency Management Suzy DeFrancis, Chief Public Affairs Officer, American Red Cross Shona Brown, Senior Vice President, Google Heather Blanchard, Co-Founder, Crisis Commons
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Note: The titles are based on each committee's information, and the same people may have different titles.

Table 3: Testimony of Academic Organizations at House Hearings (Underlines indicate academic organizations.)

Date	Committee	Hearing	Witness
April 6	Subcommittee on Oversight and Investigations, Committee on Energy & Commerce	The U.S. Government Response to the Nuclear Power Plant Incident in Japan	Martin J. Virgilio, Deputy Executive Director, Reactor and Preparedness Programs, Nuclear Regulatory Commission Donald A. Cool, Senior Level Advisor for Health Physics, Nuclear Regulatory Commission William Levis, President and Chief Operating Officer, PSEG Power LLC (Testified as a representative of the Nuclear Energy Institute) Edwin Lyman, Senior Staff Scientist, Global Security Program, Union of Concerned Scientists Michael Corradini, Chair, Engineering Physics Department, University of Wisconsin-Madison (Testified as a representative of the American Nuclear Society)
April 7	Subcommittee on Technology and Innovation, Committee on Science, Space, and Technology	Earthquake Risk Reduction	Jack Hayes, Director, National Earthquake Hazards Reduction Program (NEHRP), National Institute of Standards and Technology Jim Mullen, Director, Washington State Emergency Management Division; President, National Emergency Management Association Chris Poland, Chairman and Chief Executive Officer, Degenkolb Engineers; Chairman, NEHRP Advisory Committee Vicki McConnell, Oregon State Geologist and Director, Oregon Department of Geology and Mineral Industries
April 14	Committee on Oversight & Government Reform	Tsunami Warning, Preparedness, and Interagency Cooperation: Lessons Learned	William Leith, Acting Associate Director for Natural Hazards, U.S. Geological Survey, U.S. Department of Interior Mary Glackin, Deputy Under Secretary for Oceans and Atmosphere, National Oceanic and Atmospheric Administration, U.S. Department of Commerce Nancy Ward, Regional Administrator - Region IX, Federal Emergency Management Agency, U.S. Department of Homeland Security Kenneth Murphy, regional Administrator - Region X, Federal Emergency Management Agency, U.S. Department of Homeland Security John Madden, Division of Homeland Security and Emergency Management, State of Alaska
May 13	Subcommittees on Investigations and Oversight & Energy and Environment, Committee on Science, Space, and Technology	Nuclear Risk Management	Lake Barrett, Principal, L Barrett Consulting, LLC Brian Sheron, Director, Office of Nuclear Regulatory Research, Nuclear Regulatory Commission John Boice, Scientific Director, International Epidemiology Institute Dave Lochbaum, Director, Nuclear Safety Project, Union of Concerned Scientists

Note: The titles are based on each committee's information, and the same people may have different titles.

abstracts on this topic was March 25.

During the joint meeting held between April 30 through May 3, 2011 by the Pediatric Academic Societies (sponsored by the American Academy of Pediatrics) and the Asian Society for Pediatric Research, there were two sessions on April 30 on the Great East Japan Earthquake and the accidents at the Fukushima Daiichi nuclear power plant as well as on the Gulf of Mexico oil spill.

At 2011 IEEE International Conference on Robotics and Automation (ICRA 2011) (held in Shanghai between May 9 through 13, 2011), IEEE Robotics and Automation Society held the ICRA Special Forum: Preliminary Report on the Disaster and Robotics in Japan. The organizer of this forum was Professor Yoshihiko Nakamura from the Graduate School of Information Science and Technology at the University of Tokyo, and the panel included four Japanese researchers.

The American Nuclear Society is planning to hold some special sessions on the Fukushima Daiichi nuclear power plant during its annual meeting between June 26 and 30, 2011: Special Session: The Accident at Fukushima Daiichi—Preliminary Investigations—Panel; Public Information Workshop: Communicating with Policy Makers and the Public After Fukushima Daiichi”; ANS President’s Special Session: “Fukushima Update and Lessons Learned”; and Standards Symposium. However, there is no information about additional applications for general speakers.

In addition, American and international academic conferences on earthquake/tsunami, radiology, and nuclear power engineering are planning to hold separate sessions on the Great East Japan Earthquake. Some conferences have changed their schedules, and others have postponed the deadlines for abstracts.

During the first two months after the earthquake, there were few academic articles appearing in peer-reviewed journals, but related articles have already appeared in preprint versions and open access repositories. For example, arXiv is a site currently managed by the Cornell University Library, and some of the articles have been published, including the ones by Japanese researchers. It is not clear whether these articles could be considered to be equal to articles of journals published by established academic organizations, but this example suggests that the American academic community provided an

opportunity for researchers to submit papers on this particular earthquake and nuclear accidents.

7 Behind American Academic Organizations’ Responses

The previous sections cover American academic organizations’ responses to the Great East Japan Earthquake. These responses were, in great part, made possible due to the characteristics of these organizations and changes in the environment of international academic research. The following sections introduce the environment for such responses.

1) American Academic Organizations Have Strong Management Bases

Most of the academic organizations covered by this article are relatively large in scale and have strong management bases. For example, since immediately after the earthquake, IEEE has been able to have contributors stay in Japan to provide daily reports on the situation. The Union of Concerned Scientists publishes many reports and has the capacity to conduct its own research to be able to testify to Congress. There are many individual members, both researchers and non-researchers, who support its activities financially and in other ways. The union also receives funds from groups and organizations.

2) Significance of the Impact of the Great East Japan Earthquake on the United States

The Great East Japan Earthquake occurred far from the United States, and the only immediate risk was tsunamis along the Pacific Ocean. However, the United States took the disasters very seriously in the broad framework of natural disasters and energy policy, which has led academic organizations to take action. In that sense, the situations are similar for both the American and Japanese academic communities, but it should be noted that the Japanese academic community has been directly affected in some ways. There may have also been cases where the Japanese academic organizations were advised to be selective about releasing some information in order to avoid social unrest.

3) Characteristics of Information on the Internet Provided by American Academic Organizations

Information provided on the Internet by academic

organizations was instantaneous and diverse, unlike information through conventional print media.

It should be noted that many academic organizations reported the breaking news of the earthquake on their websites on March 11 despite the time difference and, soon after that, posted words of condolence and concern. It should also be noted that swift action was taken to provide up-to-date information of great public concern, such as tsunami forecasting and the conditions of the nuclear reactors at the Fukushima Daiichi nuclear power plant.

It is also noteworthy that individuals have been able to post information and opinions on academic organizations' websites with the authors' names through blogs and other forums. Individual blog entries did not necessarily agree with the academic organization's stance. However, these entries are presented along with official reports and opinions, and so information is provided to researchers and the public from diverse perspectives. Taking this into account is helpful when considering the ways in which Japanese academic organizations are managed.

8 Conclusion: Roles of the Academic Community to Respond to Disasters

The previous chapters cover the activities conducted by the American academic community in response to the Great East Japan Earthquake and subsequent tsunami and nuclear power plant accidents. As a conclusion, this article categorizes the roles of academic community into four groups.

1) Information Sharing

Since most of the information from Japan was in Japanese, many American academic organizations provided information in English to researchers and the public from an academic point of view. During the process, some academic organizations often added their own analyses and interpretations. These activities not only contribute to the development of academic research but also address the public's concerns.

2) Support to the Public

This particular earthquake and the subsequent nuclear accidents did not directly affect the United States. Therefore, most of the support by academic organizations was done in the form of providing

American public with related information and attempting to address their concerns. Some organizations announced their determination to support Japanese academic organizations and conducted fundraising.

3) Contribution to Policy Making

In the medium and long terms, American academic organizations have been contributing to policy making to respond to large-scale disasters. After Hurricane Katrina, the National Academies published reports. Analyses and advice were provided to support policy making from an academic point of view. Similar action is expected to be taken to respond to these particular disasters as well. Academic organizations are capable of both medium- and long-term support to policy making as well as short-term responses, including providing testimonies at congressional hearings after disasters.

4) Development of Swift and Open Academic Research

Researchers in the United States and around the world quickly began conducting research in response to the disasters. One contributing factor is that information can be exchanged instantaneously using the Internet. Academic organizations play a great role as an intermediary to promote such swift and open research activities, and the role is expected to become greater.

It is not directly related to these particular disasters, but after Hurricane Katrina, the United States government increased the support for research activities by flexibly providing research funds and allocating additional funds. This experience may have encouraged the American academic community to quickly respond to the disasters in Japan. The Japanese government also began taking a variety of actions in response to the disasters. The academic community's activities and cooperation between the community and the policy makers are expected to lead to the further development of academic research in Japan.

Outlines of the Academic Organizations Mentioned in this Article

- National Academies: <http://www.nationalacademies.org/>
The National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine, and the National Research Council make up the National Academies.
- American Academy of Arts & Sciences: <http://www.amacad.org/>
The academy, founded in 1780, consists of leaders from different academic disciplines and is an independent policy-research center that conducts multidisciplinary studies. There are about 4,000 members.
- American Association for the Advancement of Science: <http://www.aaas.org/>
AAAS, founded in 1848, is a non-profit organization dedicated to advancing science for the benefit of all people. It publishes the journal Science.
- IEEE: <http://www.ieee.org/>
IEEE was originally founded as the American Institute of Electrical Engineers (AIEE) in 1884. It is now the world's largest professional association (about 400,000 members) dedicated to advancing technological innovation and excellence for the benefit of humanity. IEEE is organized into many sections, chapters, societies, councils, and branches covering a wide range of fields relevant to engineering. For example, there are 38 societies organized by field.
- ASME: <http://www.asme.org/>
ASME is a non-profit organization founded in 1880 by machine builders and technical innovators. There are more than 120,000 members in all engineering disciplines from around the world.
- American Chemical Society: <http://www.acs.org/>
ACS is an academic organization in chemistry founded in 1876. There are more than 163,000 members around the world.
- American Crystallographic Association, Inc.
ACA is a non-profit, scientific organization of more than 2,200 members founded in 1949 through a merger of the American Society for X-Ray and Electron Diffraction (ASXRED) and the Crystallographic Society of America (CSA).
- SPIE: <http://spie.org/>
SPIE, founded in 1955, is an international academic organization to advance optics and light-based technologies, serving approximately 180,000 constituents.
- American Physical Society: <http://www.aps.org/>
APS is an academic organization for physics founded in 1899. There are 46,000 members from a wide range of physics disciplines.
- Seismological Society of America (SSA): <http://www.seismosoc.org/>
SSA is an academic organization founded in 1906 to promote research in seismology, promote public safety, protect the community against disasters due to earthquakes and earthquake fires, and inform the public for better understanding of the risks of earthquakes.
- American Geophysical Union: <http://www.agu.org/>
AGU was established in 1919 by the National Research Council and is now an independent non-profit corporation for geophysics. There are more than 60,000 members in 148 countries.
- American Academy of Pediatrics: <http://www.aap.org/>
AAP, founded in 1930, is an organization of 60,000 pediatricians.
- Health Physics Society: <http://hps.org/>
The society, formed in 1956, is a scientific organization of professionals who specialize in radiation safety. There are nearly 5,000 members.
- American Society for Radiation Oncology: <http://www.astro.org/>
ASTRO, founded in 1958, is an organization of about 10,000 radiation oncologists, radiation oncology nurses, medical physicists, radiation therapists, dosimetrists, and biologists to advance the practice of radiation oncology.

- American Society for Cell Biology: <http://www.ascb.org/>
ASCB, founded in 1960, is an academic organization of approximately 10,000 members in cell biology.
- American Psychological Association: <http://www.apa.org/>
APA, founded in 1892, is an organization of more than 154,000 psychologists and other professionals to advance the creation, communication, and application of psychological knowledge to benefit society and improve people's lives.
- Society for Neuroscience: <http://www.sfn.org/>
SFN, founded in 1969, is an academic organization of more than 40,000 scientists and physicians who study the brain and nervous system.
- American Nuclear Society: <http://www.new.ans.org/>
ANS, a not-for-profit, international, scientific and educational organization, was founded in 1954 to unify professional activities within the diverse fields of nuclear science and technology. Its membership is composed of approximately 11,000 engineers, scientists, administrators, and educators representing 1,600 plus corporations, educational institutions (universities, etc.), and government agencies.
- Federation of American Scientists (FAS): <http://www.fas.org/>
FAS was founded in 1945 by many of the scientists who built the first atomic bombs in 1945. FAS emphasizes the ethical obligation of scientists, engineers, and other technically trained people and the importance of the application of technological fruits for the benefit of humankind. In addition to the founding mission of preventing nuclear war, the organization has expanded its work to include bio-security and other issues. FAS is a think tank.
- Union of Concerned Scientists: <http://www.ucsusa.org/>
UCS, founded in 1969, is a science-based non-profit organization that combines independent scientific research and citizen action, working for a healthy environment and a safer world. Its membership is composed of more than 250,000 citizens and scientists.

Profile



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Mr. Endo studies science policy in the United States and elsewhere. In 2000, while working for Japan Society for the Promotion of Science, he established a website titled "Science Policy in the United States" (in Japanese) and has been providing information on policy trends. At Tokyo Institute of Technology, Mr. Endo has extended his study to include the relationship between science and society as well as higher education.

(Original Japanese version: published in June 2011)

[Reference]

Initial Responses Taken by Japanese Academic Organizations

Science & Technology Foresight Center

The Science Council of Japan (SCJ) website lists 1,864 academic research organizations (as of May 31, 2011). The following sections present external activities conducted by these organizations during the initial roughly two-month period immediately after the earthquake. The makeup of the organizations by field are not clear, but according to the directory of academic organization (2007–2009 version, published by Japan Science Support Foundation) in which 1,767 organizations are listed (slightly different from the SCJ's list), literature, philosophy, education, psychology, sociology, and history make up of 31%; law and political science make up 3%; economics, commerce, and business make up 7%; sciences make up 11%; engineering makes up 10%; agriculture makes up 9%; and medicine, dentistry, and pharmaceutical sciences make up 29%.

1 Activity Content

Activities conducted by these organizations can be categorized into: expression of condolence and concern; policy announcements; establishments of new offices, etc.; provision of information; collection of information (request for provision of information);

support activities; and discussion and reviews (see Reference Table 1). More specifically, these activities included: providing information in multiple languages and recruiting volunteer translators; preserving records of the damage; providing information about receiving researchers and keeping samples; providing information about radiation and geological conditions; dispatching civil engineering-related investigation teams and providing technological support; dispatching medical and psychology professionals and providing clinical support (providing handling information by condition, providing information about facilities that can take in new patients, and making arrangements to acquire medicines); and providing information on the impact of radiation, infectious diseases, and health management.

2 Activity Status

This section focuses on external activities except for expressions of condolence and concern, announcements of policies, and collections of information about the well-being of the members of their organizations.

About 20% of the organizations took some concrete

Reference Table 1: Activity Content

Expression of condolence & concern	Expressions of condolence and concern were published separately or in notices of meeting cancellations. Expressions of condolence and concern from related academic organizations overseas were also published.
Policy announcement	Policies to respond to the disasters were published separately or along with expressions of condolence and concern. (Some announced concrete policies and others just announced their determination to examine their role in society.)
Establishments of new offices, etc.	Committees to deal with the disasters, special Web pages, etc. were established.
Provision of information	Research-related information (regarding providing places for research, keeping samples, etc.) for affected researchers as well as specialized information for victims and supporters were provided.
Collection of information	Information about the well-being of the members of the organizations and information about affected areas (investigation teams, etc.) were provided.
Support activities	Specialist support was provided (dispatching specialists, setting up consultation services, providing technological support, etc.). Arrangements for necessary items were made. Research support was provided (subsidies for related research, etc.). Donations were raised.
Discussion & reviews	Proposals were made. Meetings were held. Special articles were published in organizations' journals.

*Exempting membership fees for affected members can also be interpreted as research support in a broad term, but it is not included here.

action. Most noticeably, many organizations began working with the Japan Medical Association, companies, and related associations right after the earthquake to dispatch healthcare professionals and to make arrangements for medicine and equipment. Civil engineering-related investigation teams were also dispatched. In April, many activities were initiated. Symposiums and emergency meetings to discuss future activities were held in May and afterward.

Most published information was specialized for victims and supporters (about 50% of the organizations that took concrete action published such information). These organizations provided not only their own information but also links to other websites, trying to provide as much information as possible. Also provided was information on providing opportunities for discussion, such as meetings and special editions (about 20%). And information on support activities by specialists, such as dispatching specialists, establishing consultation services, and providing technological support (about 20%).

About 40% of 535 organizations that have more than 1,000 full members conducted activities. Characteristically, economic organizations held discussions and conducted reviews; organizations related to medicine, dentistry, and pharmaceutical sciences provided information; and science organizations provided research information for victims (about half the organizations that took concrete action did this). As to discussions for future activities, economic organizations often held special sessions at conferences, and organizations related to sciences, engineering, agriculture, medicine, dentistry, and

pharmaceutical sciences held separate symposiums and lectures.

3 Cooperation between Academic Organizations

Some academic organizations worked together to respond to the disasters. Reference Table 3 illustrates such activities.

Reference Table 2 : Responses by Area of Study

Area	No. of organizations	% of organizations that took action**	% of activities by content**		
			Provision of specialized information	Responses by specialists	Discussions & reviews
Literature, philosophy, education, psychology, sociology, history	82	27%	41%	32%	18%
Law, political sciences*	4	—	—	—	—
Economics, commerce, management*	17	18%	0%	0%	75%
Sciences	55	47%	38%	8%	31%
Engineering	86	27%	30%	22%	35%
Agriculture	29	41%	33%	8%	33%
Medicine, dentistry, pharmaceutical sciences	262	46%	69%	25%	4%
Total	535	39%	55%	22%	15%

*The number of organizations is small, so the percentages are not indicated.

**The percentages are approximate figures. 0% means that the percentage is less than 10%.

Reference Table 3 : Cooperation between Academic Organizations

Title	Related academic organizations
Psychological Support Center for the Great East Japan Earthquake	Japanese Society of Certified Clinical Psychologists, Association of Japanese Clinical Psychology, Foundation of the Japanese Certification Board for Clinical Psychologists
Robotics Task Force	Japan Robot Association, the Japan Society of Mechanical Engineers Robotics and Mechatronics Division, SICE System Integration Division, IEEE Robotics and Automation Society (Japan)
Liaison Committee among JAEE, JSCE, AIJ, JGS and JSME on the Tohoku-Pacific, Japan Earthquake	Japan Association for Earthquake Engineering, Japan Society of Civil Engineers, Architectural Institute of Japan, the Japanese Geotechnical Society, the Japan Society of Mechanical Engineers
Joint emergency statement	Japan Society of Civil Engineers, the Japanese Geotechnical Society, City Planning Institute of Japan
Joint appeal issued by related academic organizations	The Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, Japan Society of Civil Engineers, Japan Concrete Institute, City Planning Institute of Japan, Japanese Geotechnical Society, Architectural Institute of Japan, Japan Institute of Landscape Architecture
Joint president statement "Japan will not stop progressing scientifically"	34 societies (440,000 members)