

Human resources development through collaboration between industry and academia

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From a vicious cycle to a virtuous cycle for philosophiae doctors

In early 2006, I made a proposition of “from a vicious cycle to a virtuous cycle for philosophiae doctors” (as indicated in the following diagram)¹⁾ at the Noyori Forum as well as in the Doctoral Course Study Panel of Nippon Keidanren (Japan Business Federation). Based on this point of view, I have been involved in human resources development through collaboration between industry and academia. It is important for industry and academia to collaboratively make concrete efforts toward realizing the virtuous cycle. Although the financial support environment has not yet been sufficiently prepared, I would like the best and brightest students to go on to the doctoral course, earn their degrees through friendly competition, and then enjoy their flourishing careers. If they can follow such a successful path, I believe that the development will activate universities and drive companies, and as a whole lead to enhancement of the nation’s international competitiveness.

Attempts toward the virtuous cycle

Fewer and fewer undergraduate students wish to go on to the doctoral course, because of postdoctoral problems in addition to the above-mentioned vicious cycle. It seems that this vicious cycle has not yet stopped, but at this juncture it would be better to expose these problems to the fullest extent. Meanwhile, plenty of measures (such as the Global COE Program, the Diversified Career Path Promotion Project, and the Innovation Creation & Young Human Resources Development Project) have been undertaken by universities,

industry, and academia. Moreover, some universities with a sense of crisis have decided on the relevant tuition waiver for the doctoral course. Member organizations and individuals of the Industry-Academia Partnership for Human Resources Development, which falls under the joint jurisdiction of the Ministry of Economy, Trade and Industry and the Ministry of Education, Culture, Sports, Science and Technology, also have been eagerly debating this issue with great interest in the doctoral courses. The following were cited as good practices at the fourth general assembly of the above-mentioned partnership²⁾: Seminars for Philosophiae Doctors, regularly hosted by The Chemical Society of Japan; Corporate-Lecturer Tour Courses (“Special Lecture on Chemical Industry Manufacturing” for doctoral course students) jointly organized by Global COE Chemistry Program of Tokyo Institute of Technology and Japan Chemical Innovation Institute (JCII); and the Internship Programs promoted by The Society of Chemical Engineers, Japan. In addition, in July 2009, the following were adopted as Industry-Academia Partnership Projects for Human Resources Development: “Manufacturing” Core Human Resources Development Program based on Polymer Science/Technology, proposed by Osaka University; and Chemical Manufacturing Education Base & Chemical Innovation Project, proposed by Shinshu University. These attempts are expected to continue and further develop horizontally.

Seminars for Philosophiae Doctors (hosted by The Chemical Society of Japan)¹⁾

Students who go on to the doctoral course are keen on learning and wish to

play an important role in academia after completing the course. Such ambition is admirable. And yet, if they became overly academia-minded or research-minded, they will lose flexibility. There are only a limited number of open positions in academia after graduation. They need to know a bit in advance that there are many other diversified areas where they would be able to demonstrate their abilities and that there are diverse values in society.

This is one of the purposes for starting the Seminars for Philosophiae Doctors, in which about 22 chemical companies participate as committee members. Through group discussions and courses with chemical companies’ engineers as lecturers, seminar attendees become informed about various industrial career paths as well as research and development (R&D) cases in the industrial arena. These seminars have already been held six times over the past two years, with seminar attendees exceeding 400 on a cumulative basis. In 2009, they will be held in Nagoya and Fukuoka. I expect that these seminars will contribute to formation of strong linkages between postdoctorals and the industrial circle.

When I visited the American Chemical Society (ACS) last year, I heard that the ACS had also started 2-day workshops called “Preparing for Life After Graduate School (PFLAGAS)” for doctoral course students, and was surprised by this coincidence³⁾. The main purpose is the same, but the contents are prepared with sufficient care and consideration to include human skill education, teaching how to write a resume, guidance on how to find a job, and even mock interviews. Japan and the U.S. share the same problems of insufficient career path education after graduation and doctoral course students’ inadequate knowledge of industrial situations.

Future issue (1): Enrichment of statistical data

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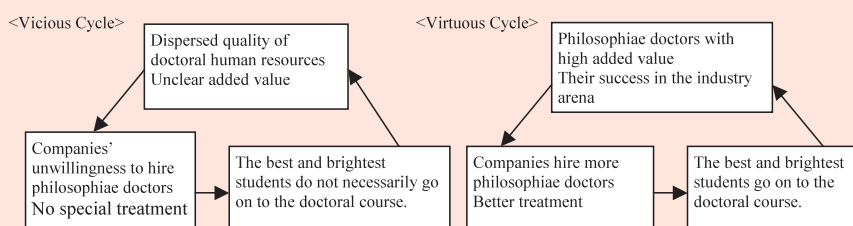


Table: Number of Doctoral Course Graduates Who Commenced Employment in the Chemical Industry and Petroleum/Coal Products Industry (including Pharmaceutical Industry)
(Source: School Basic Survey)

Year (graduated in March)	2004	2005	2006	2007	2008
Total number of job finders (persons)	332	381	426	514	558
Breakdown by major subject					
Science	43	79	67	101	108
Engineering	114	112	148	186	177
Agriculture	24	15	25	27	48
Health (pharmaceutical science, medicine, etc.)	109	122	129	136	166
Other ^(Note)	39	52	52	61	57
Other than the above ^(Note)	3	1	5	3	2

(Note) "Other" presumably includes other departments in natural science majors. "Other than the above" comprises humanities and social science majors, etc.

dents (such as statistical figures on students enrolled in universities/graduate schools, and career path after course completion) is a persistent concern in every discussion regarding collaboration between industry and academia. Especially when it comes to the chemical field, the relevant data are extremely limited. Take materials on basic surveys conducted by Ministry of Education, Culture, Sports, Science and Technology as an example. Although "Chemistry" is recognized as one category in these materials, figures in the "Other" category are so significant that "Other" presumably includes a considerable number of chemical-related cases. For this reason, the data cannot be used without modification. When I visited the Royal Society of Chemistry (RSC) and the ACS last year, I was impressed with their complete annual statistics figures. Fortunately, the School Basic Survey discloses statistical data by industry regarding the number of doctoral course graduates who commenced employment, including those graduates who commenced employment in the chemical industry and petroleum/coal products industry (including pharmaceutical industry) compiled since 2004. The latest figure (in persons) stands at 558 as of FY2008, increasing to a level 1.68 times greater than the 2004 figure of 332. The table on this page shows the annual trends and breakdown by major subject. Anyway, statistical data are essential for quantitative discussions, since participants in a discussion might be swayed by minor cases in the absence of such data. Preparation of statistical data is time-consuming and unglamorous, but it is indispensable.

Future issue (2): How to balance two kinds of postdoctorals

From the viewpoint of universities, doctoral course students are not only educational targets but also important research staff members. Accordingly, universities need to secure a certain number of philosophiae doctors for accomplishment of their research. On the

other hand, society (including academia), requires a different number of philosophiae doctors*. The two numbers are not necessarily linked, because universities and society have different objectives. To narrow this gap, some sort of grand design is necessary. Efforts to diversify career paths might raise the number of philosophiae doctors required by society in the future. Unless the two numbers are balanced, an increasing number of postdoctorals will fail to find regular jobs. As mentioned above, we first need to investigate the current situation to obtain precise statistics figures, and all persons concerned should understand the situation.

Naturally, this problem is related to quality of postdoctorals. If they are eagerly sought after by the industrial arena, the imbalance will be solved. To make this assumption come true, the virtuous cycle for philosophiae doctors has to be realized. In my opinion, it would be good if the best and brightest students could go on to the doctoral course and be granted generous financial support. I suggest establishing a selection system based on determining in advance whether applicants can be granted financial support for their doctoral course when they are still in the first year of their masters course. Such a system would help masters course students make their decision to go on to the doctoral course. If this measure could produce excellent postdoctorals, it would lead to higher evaluation of postdoctorals as a whole and ultimately lead to the virtuous cycle. The first thing to be emphasized is quality, rather than quantity.

Closing remarks

Large-scale research programs are about to start under the supplementary budget. That is a good thing in itself, but I am worried that, depending on the field of research, these programs might mobilize quite a number of postdoctorals, and that in four or five years, when these programs are completed, a new

postdoctoral problem will occur. I sincerely ask that the Japanese government and practitioners who implement these programs formulate decent plans with due consideration for the future of postdoctorals in mind.

* : Questionnaire Results by 14 Leading Chemical Companies⁴⁾: The number (ratio) of recruits by degree for fiscal year 2007 was as follows; 17 bachelors (3%), 586 masters (86%), and 75 philosophiae doctors (11%). According to some other information, philosophiae doctors account for approximately 20% in three diversified chemical companies and 10% - 15% in other several major chemical companies. Meanwhile, postdoctorals account for around 50% in major pharmaceutical companies, reflecting a rapid increase in the wake of globalization in recent years.

- 1) Isaburo Fukawa, "Hakushi Jinzai no Sekkyokuteki Saiyo wo," *Kagaku Keizai 2008-nen 2-gatsu-go pp. 26-34* (Isaburo Fukawa, "Toward Active Recruitment of Doctoral Human Resources", Chemical Economy Feb. 2008 Issue pp. 26-34)
- 2) Materials for the fourth general assembly of the Industry-Academia Partnership for Human Resources Development, July 13, 2009.
- 3) "Kagaku Bunya Jinzai Ikusei ni Kakawaru Bunseki Chosa Jigyo," *Asahi Research Center Co., Ltd., Heisei 19-nendo Chusho Kigyou Sangaku Renkei Seizou Chukaku Jinzai Ikusei Jigyo Houkoku-sho pp. 241-282*, Ministry of Economy, Trade and Industry ("Analytical Survey Project Related to Human Resources Development in the Chemical Field," Asahi Research Center Co., Ltd., FY2007 Report on Manufacturing Core Human Resources Development Project through Collaboration between Industry and Academia for Small-and-Medium-sized Companies pp. 241-282, Ministry of Economy, Trade and Industry.
- 4) Refer to page 4 of the above-mentioned FY2007 Report.

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