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Resources and Technology in Developing Nations- A Semester Study Abroad

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During the fall and winter terms of 1978-79 I had the fortunate experience of leading the St. Olaf College Global Semester. This program in structured and experiential learning has been developed to provide students from various liberal arts disciplines with an opportunity to study and travel in ten nations. Four month-long, formal courses covering a variety of subjects are prearranged at host institutions in Egypt, India, The Republic of China, and Japan. These are taught by local faculty and professionals in each of the disciplines covered. A fifth course, given by the accompanying field supervisor, extends over the entire term and is the subject of this report. The program also includes travel within each of the four major countries, and shorter stays in Rome, Athens, Jordan, Israel, Nepal, and Hong Kong. The program has been in existence since 1968 and is open to qualified students from accredited institutions. Generally about thirty students are accepted each year.

The courses taught in the host institutions, chosen to utilize the resources of the particular setting, remain the same each year. For example, in Taiwan a course on art history is taught at Soochow University near the National Palace Museum which houses much of the art treasure of China. In Egypt, the group studies history at the American University of Cairo, and field trips are arranged to Luxor and Alexandria. In Japan, eastern religions are taught by faculty primarily from Kyoto University. In India, the students are located in a village just outside of Bangalore, where they study sociology and social change. Because of the diverse backgrounds of the faculty who are chosen to lead the program, the fifth course varies considerably from year to year and no attempt is normally made to integrate it with the others. This course is usually developed during the previous year on a theme consistent with the opportunities presented by the global travel. Science courses have been offered on two prior occasions.

I chose the topic of resources and technology because it enables students to gain an awareness of the finiteness of world resources and the prospects for an improved standard of living. This kind of understanding, together with a first-hand experience of cultural diversity and the problems of



Top: The ridgetop village of Naudanda near Pokhara, Nepal. The terraced hillsides provide food for a population exceeding the carrying capacity of the land. Since wood is the only source of energy for cooking and heating, over-harvesting results in many places in devastating erosion of soil needed for agriculture. Bottom: The author with a group of Indian school children from a village near Bangalore writing their names in English.

poverty, hunger, disease, and unchecked population growth, is invaluable for those who seem certain to be confronted by these difficulties in the next decades.

In developing goals for my course I was guided by the notion that a science course should combine formal academic learning with related experience and input from the surroundings so that the course is informative, challenging, and relevant. In a course such as this, students should also acquire a broader perspective of the world and learn to apply the knowledge, tools, and insights gained through the pro-

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natural determinants, resources, or technological development in a country we would visit. The intent here was that each person develop some expertise which the group could draw upon when we arrived in that country. For example, one student wrote a paper on the Aswan Dam and the reasons for its less than anticipated success. Three papers focused on tropical or desert weather systems and the effects these have on agriculture and lifestyle. One student chose to write on the Green Revolution, another high-technology endeavor which has met with mixed success. Other papers dealt with resources, industries, agriculture, and the effects of industrialization on the environment.

In each country, I gave lectures on historical geology and geomorphology which stressed things we had seen or expected to see and the role of geological factors as determinants of the habits of living systems. Time was also devoted to methods of investigation in geology and to the formalism and concepts of the emerging view of geological history, viz., plate tectonics. To supplement the lectures in this area I used Nigel Calder's *The Restless Earth*,¹ a text which was adapted from his production for BBC television. The book presents material on a fundamental level but, unlike most texts in this category, includes numerous examples from places around the world and thus was well suited to our purposes.

Throughout the term, we used geological maps and local sources and, whenever possible, listened to a lecture by a native geologist. On field trips, students were presented with geological background material and encouraged to observe how land and water use and the location of particular industries related to natural determinants. Examples from Israel and Taiwan serve to illustrate typical field experiences.



Members of the group at the archaeological site of Petra, ancient city of the Nabateans in modern-day Jordan.

1. Nigel Calder, *The Restless Earth* (New York, Viking Press, 1973).

In Israel, two field trips were devoted to an exploration of the Jordan rift valley and the Dead Sea area. This is the northern part of a continuous rift system extending via the Red Sea into southeastern Africa, where it appears that the continent is separating. In addition to studying the tectonic features and how the landscape was formed, we learned of methods employed by the Israelis to irrigate and farm these arid lands and to establish industrial Kibbutzim. In Taiwan, we took a five-day field trip from Taipei to the south and across the incredibly steep mountain range which forms the backbone of the island. This trip was an exciting study of a very young and rugged landscape. Here we saw the effects of erosion from hastily conceived agricultural development and engineering practices which seemingly ignored a consideration of geological factors. We found that the growing marble industry on the east coast of Taiwan owes its existence to the presence of highly metamorphosed sediments there which were formed in the collision of the Philippine plate with the Eurasian continent.

In addition to the lectures and readings, we also made use of problem study groups in which an "expert" or two worked with two or three others to investigate a particular topic. The results of these studies were presented to the class by each group, giving the members an opportunity to speak on what they had learned. In this way the background material from the summer research was combined with field investigation, observation, and discussion to make the subject come alive. To avoid having each person simply give or read a report, the students experimented with different formats in their presentations and in most cases produced a program which combined significant content with imagination. One successful format used by several groups was an "evening news" approach with one person introducing the topic and providing continuity, and the others each making several short contributions. One of these presentations in India focused on an introduction to the new ecological system to which we had been recently exposed. One person gave a biological description of the flora and fauna in our vicinity and told of the changes we could anticipate in other areas we would visit. Two students in this group discussed tropical weather patterns and the influence these have on the distribution of flora and fauna in India. Another related climate and geological features to agricultural practices in various regions, with emphasis on southern India. A fifth group member spoke on endangered species and attempts by the Indian government to save them. According to the student evaluations, preparing and presenting these topics was a highlight of the course.

For another of the presentations in India and also in Taiwan, groups made site visits to industrial complexes in addition to their library research. At each site they learned where the raw materials came from, how they were transported, details of the technology employed in the fabrication process, and something about the transportation and distribution of the finished product into the economy. These studies sometimes touched on labor problems, politics, job satisfaction, employee safety, and other concerns

relating to the life of the people. In India, the discussions centered around the theme of appropriate technology, while in Taiwan the focus shifted to one of understanding the structure and stimulus for the phenomenal growth of industry in the last decade. One group considered the energy supply problem for Taiwan, its historical development, and various scenarios for its future.

In studying the more developed countries like Taiwan and Japan, neither one of which is particularly rich in indigenous raw materials, Brown's theme of global interdependence began to make more sense. In Japan we were able to study a fully developed economy like our own and to gain some new perspectives on solutions to problems common to developed nations, such as air and water pollution. It soon became clear that we as Americans could profit from a reconsideration of some of our strongly held beliefs on such things as individualized transportation, energy usage, and perhaps even our philosophical attitudes toward such things as labor-management relationships.

A benefit from this program which lies outside the area of science education but which is certainly relevant to it was the awareness we all developed for the role of national and international politics in a country's development. Two of our Egyptian professors noted that only with a sustained peace in the Middle East and a substantial effort at economic cooperation could Egypt begin to cope with its tremendous problems of overpopulation and scarcity of resources. These factors were certainly among those motivating the talks which were taking place at Camp David during our stay in Cairo. We were told by the Taiwanese that their ability to import raw materials and to maintain export markets, and thus sustain their economic viability, is crucially dependent on stable political alignments. In India, the point was made

by several lecturers that the social structure and its resistance to change could severely hamper a country in its attempts to develop, though it might be fortunate enough to possess an abundance and diversity of resources.

It is important that a program which relies on the work of so many diverse people separated by such large distances receive careful evaluation and respond to needed changes. My course and the general aspects of the program were evaluated by the students at its conclusion. In addition, each of the other four courses was evaluated by me and the students prior to our departure from each country. Ratings for the four courses given in the host institutions varied considerably, though I noted a somewhat disturbing but persistent tendency on the part of students to rate individual lecturers primarily on the basis of their charisma and ability to entertain and to ignore the lecture content. Lower course ratings were generally due to the problems of integrating a large amount of material from many different speakers. The stronger students can accomplish this on their own, but it can be facilitated by the host coordinator or principal lecturer if they are made aware that it is needed.

The program as a whole received outstanding marks, so much so that the number of applications for the next year's group nearly tripled over those we have had in recent years, in spite of increased costs. In the evaluation by the students this course was given highest marks for its relevancy to what we saw and experienced, and for the amount learned. Students commented in particular on how they enjoyed the problem study group format and the investigations they made for their presentations. Many recommended that this somehow be carried over into future courses. A few felt that the workload and the emphasis on academics was a bit much in comparison to the loads carried by global students in previous years. In retrospect, it seemed to me that this course benefited most from a strong preprogram preparation on the part of the students, a workable and relevant theme, and the opportunities for the students to combine academic and experiential learning. Of the goals set for the course, it was this integration of the academic and the experiential aspects which the students seemed to appreciate most.

There are inherent difficulties in conducting a course while supervising the operation of a program which visits 10 countries on a 19-stop itinerary and has the usual amount of gastroenteritis, other sickness, and miscellaneous mishaps. In spite of this, it is tempting to contemplate repeating the course (and the journey) in some future year with this experience as a background. In addition to the obvious improvements in lectures and the benefits of knowing ahead of time where to find resources for the students and myself, one could surely avoid some of the sickness and plan ahead for stressful settings so that the timing and pace of the course would improve. One would also be aware in advance of the potential provided by many different situations for interesting learning experiences. Just imagining the luxury of being able to anticipate a few of these things makes me actually bold enough to consider doing it all again. ■



Sunrise over the Nile with some of the group members atop Cheops Pyramid outside of Cairo.