A Seismologist in Japan

by Charles Richter

My visit to Japan realized a project of many years, originating with my very good friend, Professor Chuji Tsuboi of Tokyo University. He has been a repeated visitor to Caltech for more than 20 years and in Japan he is, deservedly, a personage of much prestige.

It appeared to both of us wisest for me to visit Japan during the academic year of 1959-1960, with no further postponement. The second world conference on earthquake engineering was to convene at Tokyo in July, 1960, and I had already considered leaving Pasadena to attend the assembly of the International Union of Geodesy and Geophysics, at Helsinki in July and August.

Preliminary arrangements were made in Tokyo, and I then applied for a Fulbright research scholarship. This was granted at the usual time for such awards, in the spring of 1959.

We sailed from Seattle in September, on the motor ship *Hikawa Maru*, which was the last passenger vessel in regular service between Japan and the United States, and has since been decommissioned.

Hikawa Maru docked at Yokohama on October 2, as scheduled. Pleasant impressions had already been created by correspondence with Fulbright House, officially the headquarters of the United States educational commission in Japan, and by the genial personality and general courtesy of its chief, Dr. Iwao Nishimura, who had accompanied us on the voyage. To these were now added a whole series of highly efficient and productive arrangements. Preliminary orientation, begun on the ship, was continued through a well-arranged lecture series, including a thoughtful and informative address by Ambassador MacArthur. Comfortable accommodation was found for us in one of the most modern apartments in Tokyo, expensive indeed on the Japanese scale, but within our means due to advantageous exchange.

At Tokyo University, where a chosen few of the

Fulbright group were welcomed by President Kaya, I was embarrassed to find that Professor Tsuboi had vacated one of his offices for me. Since this office contained his excellent personal library of books, periodicals, and reprints, in Japanese, English and other languages, I was rarely at a loss for reference material.

Geophysics, especially seismology, is a highly active field of research in Japan. If one includes the entire staff of assistants and students, the personnel considerably exceeds in numbers the corresponding figure for the entire United States. If one judges productive research in the only convenient way, by looking at publications and noting the institutions from which papers are presented at meetings, one finds that most of the work is going on at a few large institutions, either universities or government bureaus.

Tokyo University clearly occupies the first place. It still retains the prestige which attached to it as the Imperial University. Its academic standards are generally the highest in Japan, and competition for admission is extremely keen; its degree confers a distinction hardly approached otherwise in the country.

The Geophysical Institute, to which I was attached, is under the Faculty of Sciences. The celebrated Earthquake Research Institute is also located at Tokyo University; its administration is essentially independent of other branches, its head being directly responsible only to the president of the University. Its staff is drawn from specialists in various fields — geology, physics, engineering, oceanography, volcanology. Not a few, like Professor Tsuboi, occupy two professorships, one under the Faculty of Sciences and one under the Earthquake Research Institute.

Seismological stations

In Tokyo is also the headquarters of the Japan Meteorological Agency, which has a very large seismological division. More than 100 of approximately 140 seismological stations in Japan are operated by this group. Data are assembled, reports issued, and most of the research conducted at Tokyo. An especially important outpost is at Matsushiro, in the mountainous backbone of the main island, a day's journey northward from Tokyo. Instruments are installed there in extensive tunnels in granodioritic rock; the relatively low level of background "noise" makes this one of the most sensitive seismological installations in Japan, and an important contributor to the international seismological network.

Tokyo itself is of course a very disturbed location, unsatisfactory for work with small earthquakes; consequently the Earthquake Research Institute also has an outpost at Tsukubasan, about 40 miles from Tokyo, on massive granitic rock which provides an even quieter site than Matsushiro. Here it has been possible to carry on work with microearthquakes, the very smallest true earthquakes recorded by sensitive instruments (and not to be confused with microseisms, which are more or less continuous disturbances due to a variety of causes — chiefly meteorological or artificial).

There is only space for mere mention of the important geophysical and seismological work, including publications of many kinds, of the Geophysical Institutes of Kyoto University, Tohoku University (at Sendai), Kyushu University (at Fukuoka), and Hokkaido University (at Sapporo).

Largest city in the world

I found that simple arithmetic had prepared me fairly well for the impact of arriving and existing in Tokyo. This is now the largest city in the world, with a population on the rise from 8 toward 9 million — while, if one wishes to consider the metropolitan center as a whole one must include Yokohama, with another million and a half. The quaintness described by visitors of 30 years ago is no longer so much in evidence, though much of it can still be found on looking around the corner. The jinrikisha has practically disappeared, except that one specimen is still in operation in Hibiya Park, not far from the Imperial Hotel, where tourists may ride about and be photographed. Modern Western-style apartments, hotels and business blocks are rising everywhere. Tokyo Tower, a television structure resembling the Eiffel Tower, is 1092 feet high and is claimed to be the tallest independent steel tower in the world.

Public transportation in Tokyo is fast and efficient, but always loaded near capacity and in rush hours quite overloaded. There are electric railways, government and private, including a mostly elevated loop and cross-city line; over 40 numbered surface streetcar lines, and two connecting subways; and innumerable buses operated by the city and several private corporations. Taxis are numerous and not expensive; one can cross central Tokyo for a little over 200 yen (equivalent to about 60 cents), without being expected to tip. The corresponding rail or bus fare will be 30 or 40 yen at most.

The traffic situation is not good, in spite of automatic signals and traffic officers. Crooked streets with awkward intersections result in pileups, often aggravated by street work. Public improvement is at present going more toward building than streets; excavations for utilities go on everywhere.

Tokyo has a fairly high accident rate, a matter of serious public concern. Police boxes all over the city post the total of traffic fatalities and injuries for each

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day. Traffic deaths average 2 or 3 daily; injuries run normally from 150 to 250, sometimes appreciably higher.

Heavy traffic of course adds to the dust problem. The climate is relatively wet; but the soil is very fine, and its surface dries quickly, so that after a day or two without rain the slightest breeze picks up a cloud of dust. Shopkeepers throw water on the sidewalks, which decreases dust but increases mud.

Finding one's way in Tokyo is often complicated, even for a Japanese familiar with the city. For a foreigner it is at first appalling. With a few exceptions, such as the famous Ginza, streets have no names. There is no door-to-door system of house numbering, and even when numbers exist they are not displayed. The American occupation attached a system of arbitrary names to Tokyo thoroughfares, such as D Avenue and 15th Street. Many signposts showing these still remain, and if the Westerner has a map showing such names he can use it to find his way around. But these names are not known to the Japanese, and particularly not to Japanese taxi drivers. Moreover, the haphazard layout of Tokyo makes even the sign-posting confusing, so that one may find D and F Avenues posted in the same direction from the same point, or K Avenue indicated in three different directions.

A typical address

A typical address in Tokyo has four elements: the name of the ward (*ku*, of which there are 23 in Tokyo); the name of the district (*chō* or *machi*); the number of a sub-district (*chōme*); and what might be called the house number (*banchi*). Strictly this is a lot number, so it is not unusual to find several houses on the same *banchi*. Worse, there is no orderly arrangement of the numbers along streets; they scatter irregularly over the district, having originally been assigned more or less in the historical order in which the lots were occupied. No wonder that, when taking a taxi to an unfamiliar address, at least half an hour must be allowed, after the driver reaches the approximate neighborhood, for inquiries and investigation.

The postal system is geared to these addresses; mail is delivered promptly and efficiently, even if the names are written in Roman transliteration instead of Japanese characters.

Our apartment house address was 32, Nampeidai-machi, Shibuya-ku. (Our small district of Nampeidai is not subdivided into chōme.) Shibuya ward is a large formerly suburban area, two to three miles west and southwest of the center of Tokyo. Its business, amusement, and shopping center is one of the liveliest in the city; five or six such centers have grown up at the points where interurban lines depart from the loop. We were on the ninth floor of a ten-story apartment building, set on a hill west of Shibuya station, with a wide view over the city. From our window we could see Tokyo Tower to the left, and in reasonably good weather Mt. Fuji to the right; on the few rare clear days we could see the hills across Tokyo and Sagami Bays.

The perfect maid

Our apartment was Westernized to the extent of tables, chairs, and beds, with electric lighting, telephone, and an automatic gas water heater. The gas stove was a small two-burner fixture. We had to provide kitchenware and utensils, as well as a small icebox. The bath was of the usual small, deep and narrow Japanese type; my wife managed to bathe in it, but I resorted to dipping water, using a Japanese wooden bucket with a handle. The other plumbing was quite Western-style. The floor was carpeted with material which immediately displayed any careless shoeprints; shoes were regularly exchanged for slippers on entering.

Our apartment existence revolved around our marvelous maid, Sumiko-san. She was a complete household manager, did all the shopping, kept the place spotlessly clean, did the washing, and was an excellent cook in Western, Japanese, and Chinese styles. Her English, which she had learned for herself without any formal schooling, was perfectly adequate for all ordinary purposes. Of all the highly satisfactory arrangements which we owe to the Fulbright staff in Tokyo, none meant more to us than finding Sumiko.

I cannot leave the subject of Tokyo without speaking of the political demonstrations we witnessed there. Actually, our first encounter with snake-dancing and chanting crowds was in Kyoto; but with the development of the crisis over the new security treaty we became increasingly familiar with such affairs in Tokyo.

I owe it to my Japanese friends to emphasize that these demonstrations were not overtly anti-American, but anti-Kishi. Although their ultimate effect was directed against American policy, and though many of the participants were anti-American and made fiery speeches to that effect, the bulk of the demonstrators are fairly described as liberals, not radicals, with a desire for friendly relations with America. We were not personally inconvenienced; indeed, few Americans were. The only conspicuously mistreated American was Mr. Hagerty, in an incident which was deplored by the large majority of Japanese of all political affiliations.

For a large part of the demonstrations we had a box seat. Mr. Kishi's residence was in Nampeidai,

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and our ninth-floor window looked out in that direction. We became accustomed to demonstrators streaming under our window, usually preceded by sound trucks blaring out radical songs. Communist banners were much in evidence; nevertheless, only a small fraction of the crowds were Communist, or even had Communist sympathies.

Grim humor resulted when Communist headquarters criticized some of the demonstrators, saying that the student organization must take part of the blame for the one death, a girl who was trampled in the mob attempting to storm the Diet gates. For this the indignant students staged a hostile attack on the Communist office.

My chief reaction to the whole affair was regret at the effect on the university. Even those of staff members and students who were not directly involved were disturbed, and the time of research men was taken for faculty conferences. One of the most urgent needs in Japan, as everywhere today, is for trained men; and I cannot agree that any political issue should be allowed to interfere with that training.

Learning the language

Much more of my time than I had originally intended was spent in reading and studying Japanese. I never acquired conversational competence; I could understand only a few words with difficulty, and could use effectively only the words necessary to buy tickets, direct taxi drivers, and the like. My reading slowly progressed to the point where I could decipher most ordinary street signs, and could recognize the characters in place names. With this ability the horrible lost feeling which plagues foreign visitors in Tokyo disappeared; I was able to go about on the public transportation with confidence, and could be certain of not getting lost anywhere in the city in daylight.

Everyone who stays in Japan long learns to recognize a few characters, such as those for "entrance" and "exit." My wife, after some sad experiences, learned to recognize the two characters which spell Shibuya, so that she could spot a car or bus headed for home.

I began with the subway, since the station names are posted in Roman transliteration as well as in Oriental characters, and the relatively small number of stops limits one's possible mistakes. The government electric railway is nearly as well posted, but getting about on it is a trifle more complicated. Gradually, with caution, I began using streetcars and buses, and learning to read place names posted at car and bus stops. I acquired and studied a Japanese guidebook to Tokyo.

If we count the Roman transliteration, of which there are two versions, Japanese is written in four different ways. There are two indigenous syllabaries, either of them competent to write out the language; but a large part of the writing is in the originally-Chinese characters *(kanji)*. Japanese printed text is largely a combination of these characters and one syllabary *(hiragana)*, with a sprinkling of the other syllabary *(katakana)*, used chiefly to represent foreign names, and foreign words current in the Japanese language, such as *pan* for bread, *bātā* for butter, *chiizu* for cheese. *(Chizu*, with a short i, means a map. Mistakes between long and short vowels are full of such traps.) Many street signs use the syllabaries to replace or supplement the *kanji*.

Thousands of characters

Street signs were of course not my chief texts. I was busily reading instruction books and learning characters. Thousands of characters were formerly in use, and will be encountered in reference reading; my valued Rose-Innes dictionary shows nearly 5000. In 1947, by official decree, 1850 characters were designated for ordinary use; newspapers and official documents are limited to these.

One serious difficulty in learning Japanese is the completely different pattern of associated meanings. Ideas which are distinct in English may prove almost inseparable in Japanese, and vice versa. The Japanese, for instance, use no general word for "brother" or for "sister;" the usual terms mean specifically "elder brother," "elder sister," "younger brother," "younger sister." On the other hand, there is a nice word, *kyodai*, which means "brothers and sisters," an exact equivalent of "siblings," which has been revived as a technical word in English.

Scientific precision is difficult in Japanese, and many of their best research men find it easier to think and write in English terms. On the other hand, Japanese has a wonderful facility for expressing shades of doubt, probability, and uncertainty. Attempts by Japanese to transfer these nuances into English occasionally produce the inspired effects which both interest and amuse us. My favorite instance is this, from a scientific paper: "According to a newspaper, the following volcanic eruption is likely to have happened."

I cannot close without adding a note of appreciation. The uniform courtesy and consideration everywhere in Japan is unforgettable. No trouble was too much for our Japanese hosts. As a Fulbright scholar, I was a guest of the nation; it was an enviably privileged position. To the Fulbright staff, and to our hosts at the University and elsewhere, I can only express my heartfelt but inadequate thanks.