

## **HIGH-TECH COOLIES: Asian Immigrants in the US Science and Engineering Workforce**

ROLI VARMA

Generally, the influence of cultural differences in organizations is overlooked (Alder, 1997). This is especially true in science and engineering (S&E) organizations. In the dominant ideology, modern scientific knowledge is produced according to rational, universal norms. Further, modern science is understood as universal: the laws of gravity, the chemical composition of molecules, or the structure of DNA is viewed in the same way in every country. If social or cultural factors enter scientific discourse, therefore, they are viewed as creating bias.

In that ideological context, Asian immigrants in the US are presumed to receive treatment similar to their American counterparts in S&E activities. The evaluation of performance and distribution of rewards to Asian immigrants in S&E is believed to be independent of their race, gender, cultural beliefs, and birthplace. Thus, the career attainment of Asian immigrant scientists and engineers should not be significantly different from those of comparable whites.

Asian immigrants in the US, however, do not have similar chances of being promoted and getting ahead in the S&E organizations. Despite good records of achievement, they do not reach a level in which they participate in policy and decision-making responsibilities. They are seldom a part of the management team in private companies, government agencies, and institutions of higher education, despite being represented very highly as professionals. As former Commissioner Joy Cheria of the Equal Employment Opportunity Commission (EEOC) has summed up:

Virtually across the board, in private employment, in employ-

---

Address correspondence to: Roli Varma, School of Public Administration, University of New Mexico, Albuquerque, NM 87131-1216, USA, tel.: (505) 277-7756, E-mail: varma@unm.edu

ment with state, local and federal government agencies, in employment with public and private institutions of higher education, Asian Americans enjoy the distinction of being represented very highly as professionals. But for some strange reason, the same data shows that when it comes to being part of the management team those same professionals—a category of workers from whom most managers come—do a disappearing act. ... In public employment at all levels of government, Asian Americans are employed as officials and administrators at the rate of only one-third of their representation in professional jobs with the same employers. ... When it comes to employment in the ranks of executives, administrators and managers at our private and public institutions of higher learning—colleges and universities—the situation seems to be worse for Asian Americans than in any other employment sector. Here Asian American managers are only one-fourth of their participation in professional and faculty positions (Woo, 2000, p. 60).

How should those statistics be interpreted? This article argues that Asian immigrants play a role of 'high-tech coolie' in S&E organizations. They are permitted to work mainly in those S&E roles that are non-competitive with white males. Such occupations grant Asian immigrants a higher social and economic status compared with other minorities. Yet, Asian immigrants face structural barriers in career mobility into positions of authority and power. The general culture in S&E organizations views them as foreigners and holds back their careers.

The article begins by providing a brief background of migration and a selected description of Asian immigrants, which has led to their portrayal as a 'model' for other minorities in America. Then, the article questions that concept of 'the model minority' by outlining the 'silicon ceiling' which impedes upward career mobility for Asian immigrants in S&E organizations. It is followed by a discussion on theoretical perspectives, which explore diagnoses or causes of the silicon ceiling. Finally, the article summarizes the argument that Asian immigrants serve the role of high-tech coolie in S&E organizations.

---

## ■ FROM BROWN HORDES TO MODEL MINORITY

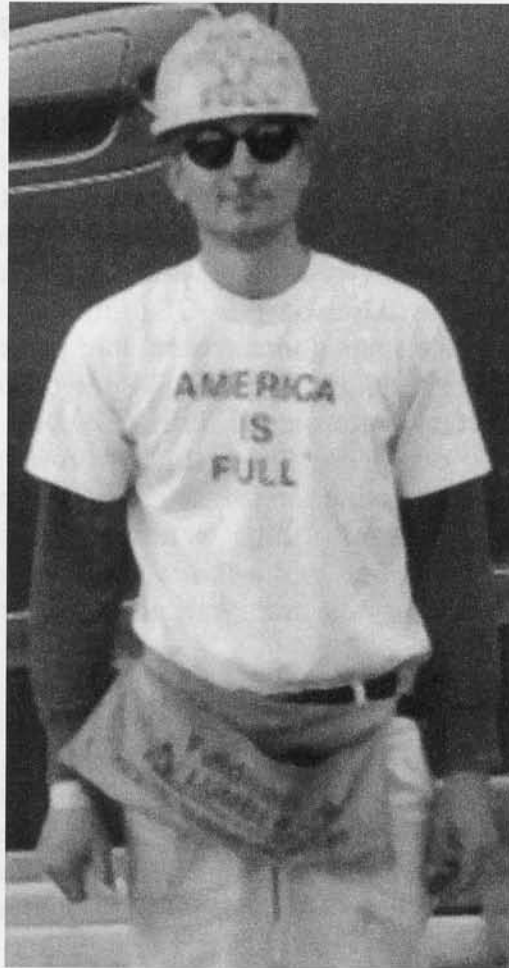
### □ *Pulling skills from Asia*

Prior to 1965 most immigrants in the US were from northern and western European countries, with the exception of immigrants from Mexico (Borjas, 1990). Early American immigration policy was based on the exclusion of 'undesirables', who were defined primarily by country of origin (Cafferty *et al.*, 1984). As a result, immigration from most of Asia was banned. The US Immigration Act of 1965 scrapped the national origins quota system, and placed Asian nations on an equal basis with other countries. Under the new law, immigrants were subject to a numerical limit (270,000 worldwide and 20,000 per country per year). These changes in immigration policy coincided with the introduction of the Sputnik programme, the growth of a new generation of high technology industries, the high demand for technical labour, and a shortage of skilled workers in the US. The justification for US immigration shifted from *skin* to *skill* qualifications.

The 1990 Immigration Act further intensified the preference system for legal immigrants in accordance with job skills by introducing temporary work or H-1B visas. The Act placed a limit of 65,000 per year on the number of foreign skilled workers entering on H-1B visas. In 1998, at the request of high technology companies in the semiconductors, software and Internet fields, Congress passed a bill to increase the H-1B visas to 115,000 for 1999 and 2000. The American Competitiveness in the 21st Century Act of 2000 further increased the limit to 195,000 for each of the next three years. By establishing one class of immigration based solely on skill, the US has created a powerful 'pull' factor for Asian scientists and engineers; the entry of potential unskilled Asians without relatives in the US is restricted.

Most Asians have been coming to the US to obtain or finish their graduate education in S&E, leading to work and then a permanent stay (Finn, 1999). The 1992 Chinese Student Protection Act made it possible for Chinese students in the US to acquire permanent resident visas. Some Asian scientists and engineers have been entering the US directly to work through family sponsorship, or on a temporary work permit visa, which is later converted into a permanent visa.

---



Credit: <http://www.projectusa.org/action-products.html#t-shirts>.

*Labour-market controversy*

As the number of immigrant workers has soared (12% of US workers), many Americans are voicing anger about immigration, especially if they have the type of job that competes with immigrants. It is either argued that new immigrants take highly skilled jobs away from American citizens (e.g. according to former Senator Alan Simpson) or that high technology companies lay off native workers to hire foreigners in order to maximize their profits (e.g. according to former Labour Secretary Robert Reich) (Alarcon, 1999). The main

---

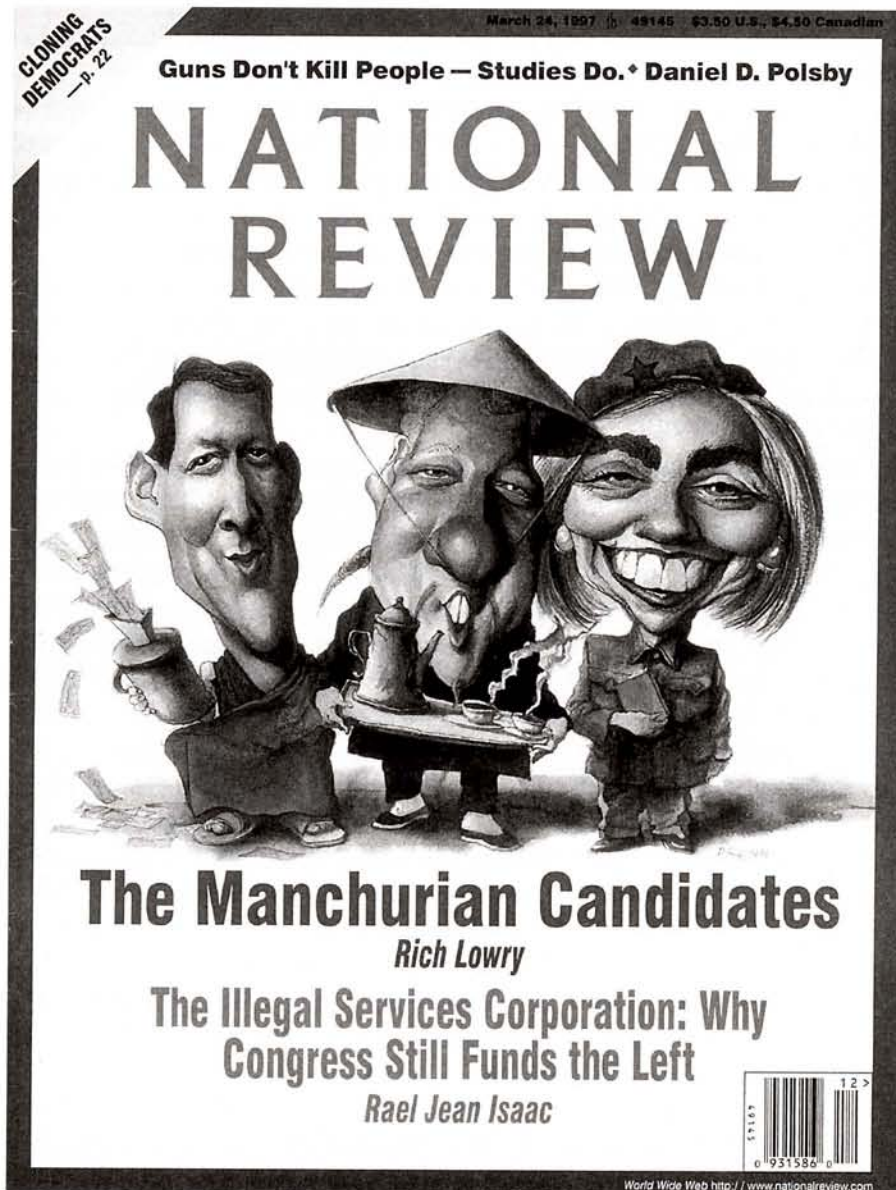
trade-union federation, the AFL-CIO, blames high technology industry for holding down its costs by hiring from abroad.

Many have been calling for more immigration restrictions. For instance, ProjectUSA (2002), a non-profit public advocacy group, has been distributing anti-immigration posters with such slogans as 'America is full', 'Democracy cannot survive overpopulation', and the 'U.S. population is now growing at a faster rate than China's'. In 1997, the *National Review* magazine ran a cover depicting President Clinton with slanted-eyes and a coolie hat, the First Lady with bucked teeth and communist garbed, and Vice President Gore in a Buddhist monk-attire. The headline said, 'The Manchurian Candidates' (Lowry, 1997).

Most allegations against Asian immigrants are made without looking at their contributions to the US economy in filling shortages of highly skilled workers. Despite recruitment and education funding, the domestic supply of scientists and engineers remains inadequate in the high technology industry (Finn, 1991). Similarly, S&E departments in universities are facing faculty shortages, caused by a decline in the number of US citizens pursuing S&E doctoral degrees (Finn and Baker, 1993). Even the increase of 195,000 is not considered enough to meet the growing high technology need of the economy. According to the US Bureau of Labor (2000), the employment opportunities for S&E jobs are expected to increase about 44% between 1998 and 2008 (14% for the whole economy). Some studies have found little evidence that American jobs are being lost in S&E (Friedburg and Hunt, 1995; National Software Alliance, 1998).

Moreover, the US is facing some competition to attract and retain Asia's best brains. As economic and social conditions are improving, some Asian countries have been pouring in resources to expand their S&E programmes and are emphasizing their high technology needs to attract scientists and engineers back home (Cao, 1996). Many Asian scientists and engineers in the US, including some Nobel Prize winners, have been attracted to their home country's world-class teaching and research facilities, up-to-date equipment, high salaries, and generous research funding. As a result, the stay rate for many Asian scientists and engineers holding doctorates in the US has fallen in recent years. In the last decade, approximately half of the doctoral recipients from China and India have accepted

---



Credit: © 1997 by *National Review*, Inc., 215 Lexington Avenue, NY, NY 10016. Reprinted with permission.

employment in the US; however, the figures for Taiwan and South Korea were down to 28 and 23%, respectively (Johnson, 1998, p. 4).

The increasing presence of Asian immigrants in S&E labour markets is a matter of necessity. Yet, the general feeling remains that Asian immigrants take more from the country and the economy than they give back.

□ *High educational and occupational status*

The failure to fill the S&E job shortage with indigenous workers has created career opportunities for Asian immigrants. Generally, immigrants from non-European countries dominate low-paying jobs (e.g. garment workers, meat packers, gardeners, hotel maids, dishwashers, and vegetable pickers). However, a notable difference is the high concentration of Asian immigrants in the S&E workforce. Asians comprise about 4% of the US population, but over 10% of its scientists and engineers; eight out of 10 Asian scientists and engineers and nine out of 10 holding doctorates are foreign-born (Kang, 1999, p. 56; National Science Foundation [NSF], 2000a, p. 3/12). By country in Asia, 12% are from India, 9% from China, 6% from the Philippines, 5% from Taiwan, 4% from Korea, 3% each from Vietnam and Japan, and less than 1% from other Asian countries (NSF, 2000a, pp. 3/26, A202). According to the US Immigration and Naturalization Service almost half of all H-1B visas go to India, followed by China (9%); the Philippines, Korea, Taiwan, and Japan account for 2.7, 2.3, 2.1 and 2.0%, respectively.

Educational achievements are lower for the foreign-born population compared with the US-born population, but they are higher for those from Asia. For instance, in 2000, the proportion who had attained a bachelor's degree was 44.9% for those from Asia—compared with 25.6% for the US-born (Lollock, 2001, pp. 4–5). Most importantly, the number of master and doctoral degrees earned by foreign-born Asians in S&E has increased far faster than those earned by US citizens. For instance, in 1997, 15,744 of the US doctoral degrees in S&E were earned by US citizens and 11,103 by foreign students, half of which went to Asian students (5,575). From 1986 to 1997, Asian foreign students have earned 57,358 doctoral degrees in S&E whereas US citizens have earned 173,088 for the same period (NSF, 2000a, p. A266). A large majority of doctoral

---

recipients from many Asian countries, particularly China and India, generally plan to stay in the US (Johnson, 1998). Finn (1999) found that the majority of 1992–93 doctoral recipients in S&E from China and India were still working in the US in 1997.

Reflecting the higher levels of academic credentials, Asian immigrants are under-represented in elementary and secondary education, but over-represented among college and university faculty. In 1997, Asian immigrants holding doctorates comprised over 12% of S&E faculty in universities and four-year colleges (Kang, 1999, p. 52). Since a higher percentage of Asian immigrants earn degrees in engineering and the private sector is the largest employer of engineers, they tend to be employed in the private sector rather than in government (Federal, state, or local). This pattern even holds for those holding doctorates. For instance, in 1997, 21% of doctoral Asian immigrant scientists and engineers were employed in the private-for-profit sector, and only 10.7% in state and local government and 9.7% in Federal government (Kang, 1999, p. 52).

In contrast to the foreign-born population—which is more likely to live in poverty, be unemployed, and earn less than the US-born population—a lower percentage of foreign-born Asians suffer economic problems. For instance, in 1997, the median income for foreign-born Asian households was \$42,900—the highest income of any foreign-born group and higher than the income for all foreign-born households (\$30,000) and US-born households (\$36,100). Similarly, in 1997, foreign-born Asians were employed in managerial and professional specialty occupations (36%); the percentage of workers in such occupations was 30% for US-born and 24% for all foreign-born workers (Berstein, 2000, p. 2). Foreign-born Asians are less likely to be employed in precision production, craft, repair, farming, forestry, and fishing.

*Changing image*

Despite the history of a ban on Asian immigration until 1965, restrictions on Asians from owning property early in the 20th century, the internment of 120,000 Japanese Americans during World War II, and racial prejudice, Asian immigrants in the US have achieved much. A high level of educational and occupational achievement has changed the image of Asian immigrants from

---



'yellow and brown hordes' to a 'model minority' who have overcome all sorts of barriers in American society (Rose, 1985).

In recent years, US television shows (e.g. *CBS's 60 Minutes* and *NBC Nightly News*), popular magazines (e.g. *Fortune*, *News Week*, *Time*, and *US News and World Reports*), and newspapers (e.g. *Wall Street Journal* and *Washington Post*) have devoted special coverage to the success of Asian immigrants in America. The general thrust in the media has been to convey the image of 'rags-to-riches' for Asian immigrants in America. A few Asian immigrants have been appearing on the *Forbes's* billionaire list and some have founded high technology companies and are chief executive officers (Forbes, 2001). Conservatives like Thomas Sowell and Dinesh D'Souza have contrasted the success of South Asians to the failures of Afro-Americans. In Silicon Valley, the home of the Integrated Circuit, IC also stands for the Indian and Chinese whose brain-power built Silicon Valley (Saxenian, 1999).

### ■ SILICON CEILING

The recent image of a successful model minority, however, works against Asian immigrants. It conveys that they have won the battle against racial discrimination in employment. It penalizes Asian immigrants by assuming that they need no mentoring, support, or resources. Their portrayal as an over-represented minority ignores inequalities within and among Asian groups. Not all Asian immigrants have made it in America; educational and occupational achievements are lower for many Southeast Asians. Most importantly, the model minority concept symbolically contrasts Asian immigrants with Afro-Americans, Hispanics, and Native Americans: if the former can succeed in America, then why not the latter? Instead of demanding government assistance to improve their economic status, minorities are told to embrace 'self-help' practised by Asian immigrants in America.

Furthermore, aggregate economic data suggesting that Asian immigrants have performed as well as whites and outperformed other minorities in the US do not provide a complete picture. First, nearly half of all foreign-born Asians are geographically concentrated in three metro areas: Los Angeles, New York and San Francisco (Lollock, 2001, p. 1). In these areas both income and cost of living

---

are very high. So, if they earn more they also spend more. Similarly, foreign-born Asians have large families (3.26 people) and thus more wage earners per family than whites (2.56 people). Asian immigrants' labour participation rate is higher than the population as a whole (Berstein, 2000, p. 2). As a result, the income comparisons with whites and other minorities are somewhat inconclusive. Third, data on managers combine salaried managers in large organizations with self-employed managers. Since often most Asian immigrant managers are self-employed, they do not enjoy employment opportunities, benefits, and the security of managers in the corporate and public sectors.

Proponents of the model minority thesis seldom examine how Asian immigrants fare in terms of upward mobility after they enter the S&E profession. Getting their foot into the door is not the same as getting ahead in the S&E professions. Even with high education for career advancement, Asian immigrants in S&E organizations are far from achieving social and economic parity. The higher educational attainment in highly paid S&E fields of Asian immigrants is partially reflected in salaries and occupational status vis-à-vis their white counterparts (Wong and Nagsawa, 1991; Asian Americans for Community Involvement [AACI], 1993; Tang, 1993, 1997, 2000; Federal Glass Ceiling Commission, 1995; Wu, 1997; Woo, 2000; Varma, 2001).

Asian immigrants generally are paid less than comparable whites with similar qualifications in S&E occupations. For instance, in 1997, the median annual salaries of male doctoral scientists and engineers from Asia was \$67,000—\$3,000 lower than whites with similar qualifications, though \$4,000 higher than Afro-Americans. Female Asian immigrants with a doctorate earned a similar amount to white and Afro-American females (\$53,000), but lower than males (Kang, 1999, p. 81). This pattern also holds across most broad occupations and age groups (Goyette and Xie, 1999).

Data on occupational status shows that high-ranking administrative positions in S&E for the public and private sectors vary by ethnicity. Although Asian immigrants account for a high percentage of the S&E workforce, they are rarely administrators in supervisory positions. When Asian immigrant scientists and engineers do reach managerial positions, it is after a longer length of time than similarly qualified whites. Interestingly, Asian immigrants are less likely to be

---

in managerial jobs than Afro-Americans and Hispanics (NSF, 2000a,b).

In private industry—a sector preferred by Asian immigrant scientists and engineers—they are less likely than whites to be engaged primarily or secondarily in management. Further, the median number of direct and indirect subordinates is lower for Asian immigrant scientists and engineers than for whites (NSF, 2000b, p. 61). As an example, although 60% of Indians, 57% of Chinese, and 53% of whites are employed in professional and managerial occupations in Silicon Valley high-technology industries, only 15% of Indians and 16% of Chinese are managers compared to 26% of whites (Saxenian, 1999, Table 2.5).

In government national laboratories, even fewer Asian scientists and engineers compared with whites have management as their primary or secondary activity. For instance, at Livermore National Laboratory, Asians make up about 4% of scientists but only about 1% of them are in management (Locke, 2000, p. 3). Similarly, at the Los Alamos National Laboratory, out of 99 senior managers, only one is of Asian descent; and of 322 leaders of technical groups, a lower rank in management, only three are Asians (Glanz, 2000, p. B5).

In academic institutions—where Asian immigrants are over-represented in S&E—very few hold administrative positions (Philipkoski, 2000). Among full-time ranked doctoral scientists and engineers in 1997, 37% of Asians compared with 47% of whites were full professors. For the same period, 37% of Asian doctoral scientists and engineers in four-year colleges or universities, compared with 57% of whites were tenured (NSF, 2000a, p. 4/37). Some of these differences are related to variations in the number of years since the doctorate was awarded. Nonetheless, it is rare to find an Asian department chair, a dean, or a provost in S&E in academic institutions (Watanabe, 1995; Tang, 2000).

Asian immigrants face what has been called the glass ceiling—artificial barriers, based on attitudinal or organizational biases, that prevent qualified individuals from advancing upward in their organizations to management level positions. The concept of glass ceiling was initially used in the mid-1980s to depict women's blocked promotions in corporate America. The Federal Glass Ceiling Commission (1995, p. 101) later applied the same concept to ethnic

---

minorities and found Asian Americans facing an 'impenetrable glass'.

### ■ WHY SO FEW?

How to explain the disproportionately small representation of Asian immigrants in positions of authority and decision-making? The literature ranges from 'cultural' to 'structural' explanations. The former suggests the absence of requisite qualifications (e.g. language deficiencies) or a lack of candidates (e.g. not seeking managerial positions), while the latter suggests organizational characteristics (e.g. racial prejudice) impeding career advancement of Asian immigrants in S&E organizations.

#### *Eastern versus Western culture?*

Cultural differences between Western and Asian countries have been identified in terms of modern and traditional values. Several scholars have identified many work-related dimensions on which Western and Asian cultures differ. Most frequently cited characteristics within Western cultures are: universalism; individualism; inner-directed orientation; time as sequence; achieved status; and equality. In contrast, characteristics within Asian cultures are: particularism; collectivism; outer-directed orientation; time as synchronization; ascribed status; and hierarchy (Hofstede, 1984; Dumont, 1986; Bedi, 1991; Redding and Baldwin, 1991; Stewart and Bennett, 1991; Simons *et al.*, 1993; Trompenaars, 1994; Alder, 1997). Generally, scholars use this 'two worlds' theme to describe various disparate and contradictory aspects of new immigrants in the US.

For instance, Americans are viewed as desiring individual mobility to fulfil the 'American Dream' of individual accomplishments. They assume personal responsibility, pay attention to the enhancement of each individual's rights, and focus on general rules. Asian immigrants, on the other hand, are viewed as relying more on the priorities of a group or an organization than concern for themselves. For Asian immigrants, friendships with colleagues, managers, and others take precedence over their own interests.

Similarly, the dominant ideology of American culture emphasizes equality. Hierarchy emerges as the result of competition in which everyone starts from the same position and enjoys the same rules. In

---

contrast, the dominant ideology of Asian societies emphasizes hierarchy, which is ascribed and fixed. Social ordering is not through horizontal bonds but through vertical allegiances to people holding a higher rank on the basis of age, gender, status, wealth, or power. Accordingly, Asian immigrants tend to observe the cultural tradition of deference to people above them. They tend to work under one another's shadow.

Such cultural values of Asian immigrants are viewed as a liability in the US organization of S&E. Being brought up to be modest, honour wisdom, work hard, and let the work speak for itself, Asian immigrant scientists and engineers do not boast of their achievements. Their low-key, self-effacing, and team approach work against them in American S&E organizations which reward aggressive, assertive, and outspoken individuals. Even when Asian immigrant scientists and engineers acknowledge their unfair treatments, they still avoid conflict with those in a higher position. They remain patient and hope that one day their time will come. By not taking an active part in the organizational dynamic, Asian immigrant scientists and engineers do not use the American system to work in their favour.

Nonetheless, such cultural explanations tend to reinforce popular stereotypes. With a great variety of histories, customs, languages, and religions, Asian immigrant scientists and engineers themselves are not a homogeneous group. Yet the same cultural categories are attributed to all those from Asia.

Likewise, national cultures tend to manifest contradictions. For instance, many Asian immigrant scientists and engineers are Westernized because science in many parts of Asia is a sign of modernity. Most of them are trained in American graduate schools, and thus do not differ significantly from Americans in routine S&E activities. Although Asian immigrants see cultural differences between Eastern and Western cultures, they do not like to be called minority. Instead, they consider themselves to be the equivalent of their white counterparts (Federal Glass Ceiling Commission, 1995, p. 103).

Most importantly, if Asian immigrants succeed in S&E due to cultural emphasis on education and hard work, they are symbolically placed against Afro-Americans and other minorities. Likewise, if Asian immigrants fail to advance in S&E, they themselves are to blame and should change their cultural values from collectivism to

---

individualism. In other words, Asian immigrant scientists and engineers should not make any demands for institutional assistance. Proponents of cultural differences ignore institutional policies that create obstacles for Asian immigrants in the S&E workforce, and thus serve the status quo.

*Poor language skills?*

The silicon ceiling is often attributed to language difficulties of foreign-born Asian scientists and engineers. For instance, Christopher Daniel argues that differences in linguistic abilities and cultural backgrounds between Asians and whites are better explanations of the disparities between the two rather than job discrimination (Lewis and Kim, 1997). Generally, Asian immigrant scientists and engineers have some language barriers since English is their second language, and they have an accent. With limited English proficiency, it is difficult to imagine Asian immigrants climbing to high-ranking administrative positions in S&E organizations.

However, not all Asian immigrants are recent immigrants or lack communication and linguistic abilities. A significant number of Asian immigrants moved to the US as children and thus speak with an American accent. Many have gone through English medium schooling and training in their home country and thus are proficient in English. The example of immigrants from India in S&E is instructive because they tend to have little language difficulties compared with those from China. Still, the occupational status of Indian immigrants in S&E organizations remains lower than whites with similar qualifications. Further, it is not clear why colloquial English with an American accent should be a pre-requisite in promotion evaluations.

The Federal Glass Ceiling Commission (1995) found those foreign-born whites with poor language skills and an accent do not face blocked mobility like Asians. This suggests the existence of racial barriers or the possibility that European scientists and engineers with English-language difficulties are treated differently than are those who emigrated from Asia. This is not to deny that Asian immigrants may need to improve their English proficiency in their educational aspirations and for career advancement in S&E organizations.

---

*Technical over managerial positions?*

Many have argued that the relatively lower representation of Asian immigrant scientists and engineers in managerial positions could be due to their preference for technical positions over business ones (cited in Lewis and Kim, 1997). If Asian immigrants have a low tendency to enter managerial positions, then S&E organizations end up facing the supply barrier.

It is true that Asian immigrants pursue S&E much more than social sciences, management, law, or public affairs. For instance, in 1997 Asian immigrants represented 4% of social scientists, but more than 10% of scientists and engineers (Johnson, 1998, pp. 21–22). This is partially because Asian immigrants grew up in societies where S&E was perceived to be associated with high monetary returns, job opportunities, prestige and intelligence. Also, Asian foreign students in the US tend to pursue education in S&E and their stay rates are higher in S&E fields and lower in the social sciences (Finn, 1999). Nonetheless, in most S&E organizations, managers tend to be scientists or engineers by training before taking managerial responsibilities; it is rare to find social scientists, lawyers, or business administrators as managers in S&E organizations.

However, over-representation of Asian immigrants in the S&E fields cannot be taken to mean that they are only interested in technical positions, and not in managerial positions. Since hierarchy is highly valued in Asian countries and management positions are associated with status and prestige, many Asian immigrant scientists and engineers desire to hold managerial rank, but are not optimistic about their chances to be promoted (Wong and Nagsawa, 1991; AACI, 1993). If they feel their higher education and high job performance rates will not lead them to senior management positions, they are unlikely to apply for such positions. A case study of Chinese and Indians in Silicon Valley found that they believed their advancement to managerial positions was limited by race (Saxenian, 1999). The Federal Glass Ceiling Commission (1995) found Asian Americans frustrated at their inability to access senior decision-making positions.

 *Stereotypes and prejudice*

Differences in cultural backgrounds, linguistic abilities, and occu-

---

pational choices between Asian immigrants and whites remain a partial explanation of the silicon ceiling in S&E occupations. Labour market discrimination—unequal treatment of workers because of their membership in a racial/ethnic group—provides a more persuasive explanation for the disparities between the two groups.

Until the 20th century, only a few privileged minorities were allowed in the S&E profession in the US. There has been a long history of racial differences between white men and minorities as an explanation for the differences in minorities' behaviour, which leads to inequality (and inferiority) in general, and in S&E in particular (Gould, 1981). To readdress past discrimination, academic institutions, government agencies, and private companies are making an attempt to educate, train, hire, and promote racial minorities in the S&E fields. Affirmative action programmes have been a major driving force behind the goal to achieve organizational diversity (Cox, 1995). Since the mid-1970s, there has been a steady growth in the number of S&E degrees granted to minorities and their presence in S&E positions. As a result, overt discrimination against minorities in S&E occupations has been on the decline. However, they continue to face subtle discrimination. In fact, skilled minorities experience greater subtle discrimination than the less skilled because the competition to perform well is rather intense for the former group than for the latter group (Becker, 1991).

Many studies have found overt and subtle bias in the decision-making process of promotion of Asian immigrants in the corporate sector (Becker, 1991; Federal Glass Ceiling Commission, 1995). In academia, standards for hiring, tenure, and promotion magically change for Asian immigrant faculty in S&E (Manrique and Manrique, 1994). They receive little mentoring from the deans, chairs, or senior colleagues during the tenure and promotion process. Woo (2000) finds the same phenomenon in the government sector.

There are several reasons for employers in S&E organizations to discriminate against Asian immigrants. Generally, cultural values for promotion end up reflecting traditional 'white male' values. The unstated, but ever present question is whether Asian immigrant scientists and engineers are like their white counterparts. Asian immigrants are generally viewed as 'foreigners', 'outsiders', and 'strangers' (Fletcher, 2000; Stober and Hoffman, 2001). The entertainment industry has given an image of the mysterious Asian

---



immigrants. Asian women are portrayed as obedient and motherly figures on the one hand and as the exotic and fragile on the other. Due to stereotypes and prejudice, many employers tend to fear insubordination from white co-workers as well as other managers (Tang, 2000, p. 57). For instance, Asian immigrants are accepted to give orders and supervise other Asians, but not to white co-workers and managers.

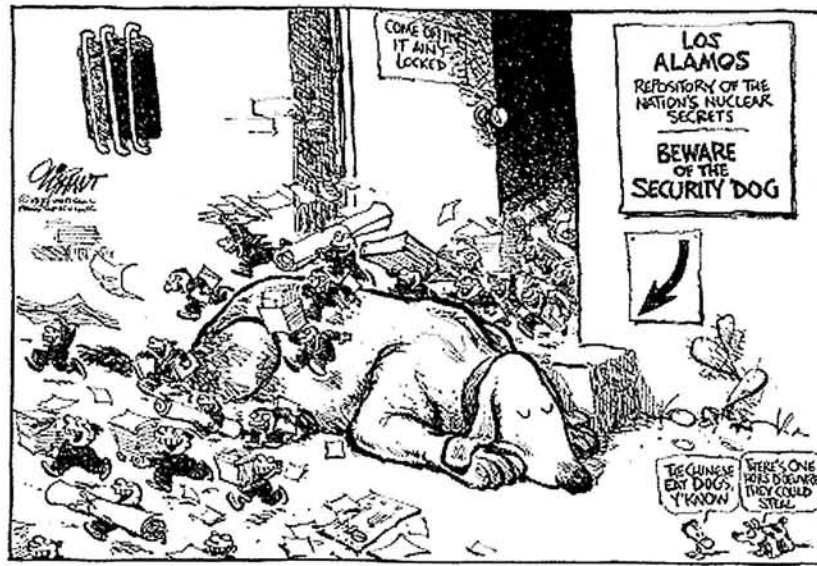
The recent experience of scientist Wen Ho Lee, a Taiwanese naturalized American citizen, demonstrates how Asian scientists and engineers are treated with suspicion. In December 1999, the US government alleged that China had pursued an espionage campaign for US nuclear secrets and stole them. China has denied such allegations. The US government accused Dr Lee of downloading hundreds of classified files at Los Alamos National Laboratory in New Mexico. Dr Lee has maintained that he was creating a backup in case of a computer crash and has never spied for China or any other country. Further, files which he downloaded in 1993 and 1994 were classified 'Protect as Restricted Data'; they became 'Secret' or 'Confidential' in 1999 (Lee, 2001, p. 262).

After conducting a massive investigation for Chinese espionage and keeping Dr Lee in a tiny solitary confinement cell for nine months, the government dropped all but one of 59 charges against him. Federal Judge James Parker set him free with an apology and extremely harsh criticism for the government's conduct (Stober and Hoffman, 2001). Dr Lee was fired from his job and has not been reinstated.

Asian immigrant scientists and engineers at Los Alamos and other national laboratories were hardest hit by the security procedures implemented after Dr Lee's arrest. They were under the microscope if they had friends or relatives in the so-called sensitive countries. Their computer access was revoked and foreign travel was restricted. They were removed from sensitive projects and their authority was eroded without explanation (Glanz, 2000; Locke, 2000; Lawler, 2000a,b; Stober and Hoffman, 2001).

Many Asian scientists and engineers, especially foreign-born, throughout the US experienced systematic harassment because of their ethnicity. The backlash against Asian scientists and engineers can be seen from ethnic slurs at work and in the media. For instance, an Asian physicist at Los Alamos Laboratory received an e-mail:

---



Credit: Oliphant © 1997 Universal Press Syndicate. Reprinted with permission. All rights reserved.

'Wen Ho Lee should be supported (by the neck), cut down, drawn, and quartered' (Lawler, 2000b, p. 1072). Similarly, a cartoon by Oliphant (1999) showed a horde of tiny figures with buckteeth and thick glasses, hurrying over a giant sleeping security dog at Los Alamos laboratory. The bubble said, 'The Chinese eat dogs y'know'. *ABC Nightline* (1999) carried a high profile report on hostility against Asian immigrants following charges of Chinese espionage. Unlike Chinese Americans, white Americans have not been held responsible when the latter were found to have sold secrets to the Russians. Dr Lee's case shows the prevalence of an old view that an Asian is an Asian, no matter whether he or she is an American citizen.

Another prevalent view of Asian immigrants is as 'passive, unassertive, indirect, more equipped for technical than people-oriented work, and therefore not leadership material' (Federal Glass Ceiling Commission, 1995, pp. 104–105). In the US, it is believed that upper-level administrators must possess refined conceptual skills to perform strategic planning for the organization; contrarily, lower-level administrators perform specific, i.e. more predictable, functions for the organization. Typically, Asian immigrants are seen as good at

'programmed decisions' (e.g. routine repetitive decisions that are learned in advance) rather than 'non-programmed decisions' (e.g. unpredictable, creative, quick, and risky decisions that are not formalized) (Wu, 1997). Consequently, Asian immigrants are viewed to be mimetic rather than original and are taken to be suited for carrying out other peoples' orders and ideas. In other words, they should not be bosses, but be bossed. The Federal Glass Ceiling Commission (1995, p. 102) found that Asian immigrants rarely came to chief executive officers' (CEO) minds as prospective managerial candidates. Further, CEOs viewed the glass ceiling in terms of women. If reminded that it also affects minority men, they interpreted minority as Afro-American, and not as Asians.

It is difficult to believe that among a diverse mix of Asian immigrant scientists and engineers, no one is capable of providing inspirational leadership. Furthermore, their cultural background can make them better managers in the changing global economy. Their participatory administration means involving subordinates in decision-making, encouraging discussion, and seeking egalitarian solutions to problems (Wu, 1997). Since Asian immigrant scientists and engineers are above the national average in terms of educational achievement, they are prepared for management.

Many Asian immigrants have responded against the ideology of 'good technicians, rather than good managers' by leaving the workplace to start their own high technology businesses (e.g. David Lam founded Lam Research; Narpat Bhandari founded Aspen Semiconductor; Vinod Khosla founded Sun Microsystems; David Lee founded Qume; Lester Lee founded Ampex; Suhas Patil founded Cirrus Logic; and Steve Tran founded BeVocal). By 1998, Chinese and Indians were running a quarter of Silicon Valley's technology businesses, which accounted for 17% of the total technology sales and 14% of total technology jobs (Saxenian, 1999).

*Being outside the social network*

Social networks emerge as a matter of necessity around scientists and engineers who must pool resources and talent, providing members of these networks with special access to information that is not available to those outside. Social networks influence how individual scientists and engineers exchange ideas, information and resources in ways

---

that other forms of information transfer do not (Etzkowitz *et al.*, 2000). Social networks provide information, validation, and encouragement. Tang (1997) notes that getting ahead in S&E often depends on 'what you know' (human capital) as much as 'who you know' (social capital).

Asian immigrant scientists and engineers possess human capital as reflected in their higher education and training. However, they remain outside the formal and informal network, and thus miss crucial opportunities for further career advancement. If they are not excluded from the 'old boys network', then Asian immigrants can acquire, as well as increase, information of the labour market in S&E occupations.

Presence of role models, mentoring, and active encouragement from colleagues and managers are key factors in motivating Asian immigrants to switch from the technical to the managerial ladder. Since the number of Asian administrators and managers is quite low in S&E organizations, it reinforces the image that such positions are not meant for them (AACI, 1993). This is a chicken-and-egg problem. The lack of mentors brings little inspiration and contact for Asian immigrant scientists and engineers to climb the managerial ladder.

Many Asian immigrants in S&E, therefore, have taken matters into their own hands by forming a wide range of professional and technical networks and institutions that facilitate job searching, information exchanges, and access to capital and managerial know-how for new immigrants (Saxenian, 1999). Ethnic social networks are collective responses of Asian immigrant scientists and engineers to the sense of exclusion from established social structures in S&E organizations.

### ■ CONCLUSION: HIGH-TECH COOLIES

Foreign-born Asians have made vast strides in education and employment, as compared with other minorities in the US such as Afro-Americans, Hispanics, and Native Americans. They have taken higher education in S&E as a pathway to advancement in American society. Their high level of academic achievements is reflected in their high percentage in professional and technical occupations.

---

They have been viewed a 'model' for under-represented minorities in S&E.

Yet, Asian immigrant scientists and engineers with similar educational background and skills as whites do not have comparable prospects of success in career attainment. The traditional arguments for the lack of advancement (e.g. lack of education, lower scores in science and mathematics, and bias in socialization leading to lower commitments to S&E), which are put forth for women and under-represented minorities, do not apply to Asian immigrants. Their lower prospects have been explained by new cultural arguments—such as preference for technical over managerial work, lack of communication and linguistic skills, and passive cultural values unsuited for leadership. Such alternative explanations, however, serve to justify and normalize the absence of Asian immigrants in high-profile S&E positions. Stereotypes, racial prejudice and bias remain inescapable though people seldom like to talk about them in S&E organizations. Many employers, consciously or unconsciously, use race/ethnicity as the basis for job assignments and promotion in S&E organizations. Asian immigrants face internal barriers such as lack of mentoring, biased rating and testing systems, little access to network, counterproductive behaviour by colleagues, and a working climate leading to isolation. Frustrated with their ability to move up, Asian immigrants have come to view their status as 'high-tech coolies' (Agarwal, 2000).

Obstacles faced by Asian immigrants raise doubts regarding the tendency toward universalism in 'hard' science, as suggested by Merton (1973) and others (Hergens and Hagstrom, 1982; Bowen and Rudenstine, 1992; Cole, 1992). It appears that the mainstream S&E culture ignores social/cultural differences between Asians and Americans when it comes to philosophical issues on S&E activities, but holds on when it comes to the promotion of Asians.

Currently, S&E organizations accept and support diversity to a much lesser extent than their ideal holds. The issue is not whether S&E organizations have people of diverse backgrounds, since social and cultural diversity results inevitably from the US demographic realities. Rather, the issue is how to put diversity of Asian immigrants in S&E organizations to the best possible use. For instance, mentoring can help Asian immigrants to attain the qualifications needed for managerial positions. Management training should be made avail-

---

able to those who need it in order to move beyond technical grades. Similarly, language development programmes should be provided. Most importantly, there should be institutional initiatives to minimize stereotyping, to counter prejudice, to improve cross-cultural interactions, and to modify organizational practices.

### ■ ACKNOWLEDGEMENTS

This research was supported by the National Science Foundation (SES 0136467). I would like to thank Scott Sandoval for assisting me in the literature search.

### □ REFERENCES

- ABC (1999) *Nightline*. Available at <<<http://abcnews.com/onair/nightline/transcripts/nl990628-trans.html>>>.
- Agarwal, V.K. (2000) 'Diamond ceiling for Asian Americans', *Science*, 290 (15 December): 2075.
- Alarcon, R. (1999) 'Recruitment processes among foreign-born engineers and scientists in Silicon Valley', *American Behavioral Scientist*, 42(9): 1381–1397.
- Alder, N.J. (1997) *International Dimensions of Organizational Behavior*. Boston: Kent Publishers Company.
- Asian Americans for Community Involvement (AACI) (1993) *Qualified But ... A Report on Glass Ceiling Issues Facing Asian Americans in Silicon Valley*. San Jose: AACI.
- Becker, G.S. (1991) *The Economics of Discrimination*. Chicago: University of Chicago Press.
- Bedi, H. (1991) *Understanding the Asian Managers*. Sydney: Allen & Unwin.
- Berstein, R. (2000) 'From the Mideast to the Pacific: a profile of the nation's Asian foreign-born population', *Census Brief CENBR/00-4*. Washington, DC: US Census Bureau.
- Borjas, G. (1990) *Friends or Strangers: The Impact of Immigrants on the US Economy*. New York: Basic Books.
- Bowen, W.G. and Rudenstine, N.L. (1992) *In Pursuit of the Ph.D.* Princeton: Princeton University Press.
- Cafferty, P.S.J., Chiswick, B.R., Greeley, A.M. and Sullivan, T.A. (1984) *The Dilemma of American Immigration: Beyond the Golden Door*. New Brunswick: Transaction Books.
- Cao, X. (1996) 'Debating brain drain in the context of globalisation', *Compare*, 26(3): 269–284.
- Cole, S. (1992) *Making Science: Between Nature and Society*. Cambridge: Harvard University Press.
- Cox, T. (1995) 'A diversity framework', in M.M. Chemers, S. Oksamp and M.A. Costanzo (Eds), *Diversity in Organizations*. Thousand Oaks: Sage Publications.
-

- Dumont, L. (1986) *Essays on Individualism*. Chicago: University of Chicago Press.
- Etzkowitz, H., Kemelgor, C. and Uzzi, B. (2000) *Athena Unbound: The Advancement of Women in Science and Technology*. Cambridge: Cambridge University Press.
- Federal Glass Ceiling Commission (1995) *Good for Business: Making Full Use of the Nation's Human Capital*. Washington, DC: US Government Printing Office.
- Finn, M.G. (1991) 'Personnel shortage in your future?', *Research Technology Management*, 34(1): 24-27.
- Finn, M.G. (1999) *Stay Rates of Foreign Doctorate Recipients from US Universities*. Oak Ridge: Oak Ridge Institute for Science and Engineering.
- Finn, M.G. and Baker, J.G. (1993) 'Future jobs in natural science and engineering: shortage or surplus', *Monthly Labor Review*, 116(2): 54-61.
- Fletcher, M.A. (2000) 'Asian Americans coping with success', *The Washington Post*, 4 March: A03.
- Forbes (2001) 'Forbes billionaire', *Forbes*, 9 July 9. Available at <<<http://www.forbes.com/billionaire>>>.
- Friedburg, R.M. and Hunt, J. (1995) 'The impact of immigrants on host country wages, employment, and growth', *Journal of Economic Perspectives*, 2(1): 40-51.
- Glanz, J. (2000) 'Amid race profiling claims, Asian-Americans avoid labs', *The New York Times*, 16 July: B1.
- Gould, S.J. (1981) *The Mismeasure of Man*. New York: W.W. Norton.
- Goyette, K. and Xie, Y. (1999) 'The intersection of immigration and gender: labor force outcomes of immigrant women scientists', *Social Science Quarterly*, 80(2): 395-408.
- Hergens, L.L. and Hagstrom, W.O. (1982) 'Scientific consensus and academic status attainment patterns', *Sociology of Education*, 55(2): 183-196.
- Hofstede, G.H. (1984) *Culture's Consequences: International Differences in Work-related Values*. Beverly Hills: Sage Publications.
- Johnson, J.M. (1998) *Statistical Profiles of Foreign Doctoral Recipients in Science and Engineering: Plans to Stay in the United States*. Arlington: National Science Foundation.
- Kang, K.H. (1999) *Characteristics of Doctoral Scientists and Engineers in the United States*. Arlington: National Science Foundation.
- Lawler, A. (2000a) 'New breed of protester asks: why not us?', *Science*, 290 (10 November): 1075.
- Lawler, A. (2000b) 'Silent no longer: model minority mobilizes', *Science*, 290 (10 November): 1072-1077.
- Lee, W.H. (2001) *My Country Versus Me*. New York: Hyperion.
- Lewis, G.B. and Kim, P.S. (1997) 'Asian Americans in the federal service: education, occupational choice, and perceptions of discrimination', *Public Administration Review*, 57(3): 267-269.
- Locke, M. (2000) 'Some Asians leaving labs, fewer coming', *Asian Week*, 21(30): 3-5.
- Lollock, L. (2001) 'The foreign born population in the United States', *Current Population Reports P20-534*. Washington, DC: US Census Bureau.
-

- Lowry, R. (1997) 'China syndrome', *National Review*, 24 March: 38.
- Manrique, G.G. and Manrique, C.G. (1994) 'Immigrant faculty and American higher education', *Proteus: A Journal of Ideas*, 11(3): 31-34.
- Merton, R.K. (1973) *The Sociology of Science*. Chicago: University of Chicago Press.
- National Science Foundation (2000a) *Science and Engineering Indicators*. Arlington: National Science Foundation.
- National Science Foundation (2000b) *Women, Minorities, and Persons with Disabilities in Science and Engineering*. Arlington: National Science Foundation.
- National Software Alliance (1998) *Software Workers for the New Millennium*. Arlington: National Software Alliance.
- Oliphant, P. (1999) Available at: <<[http://www.ucomics.com/patoliphant/viewpo.cfm?uc\\_full\\_date=19990430&uc\\_comic=po&uc\\_daction=X](http://www.ucomics.com/patoliphant/viewpo.cfm?uc_full_date=19990430&uc_comic=po&uc_daction=X)>> .
- Philipkoski, K. (2000) 'Asian scientists hit a ceiling', *Wired News*. Available at <<<http://www.wired.com/news/print/0,1294,34110.00html>>> .
- ProjectUSA (2002) Available at <<[http://projectusa.org/us\\_immigration\\_arguments.html](http://projectusa.org/us_immigration_arguments.html)>> .
- Redding, S.G. and Baldwin, E. (1991) *Managers for Asia/Pacific: Recruitment and Development Strategies*. Hong Kong: Business International.
- Rose, P.I. (1985) 'Asian Americans: from pariahs to paragons', in N. Glazer (Ed.), *Glamor at the Gates: The New American Immigration*. San Francisco: Institute for Contemporary Studies.
- Saxenian, A.L. (1999) *Silicon Valley's New Immigrant Entrepreneurs*. California: Public Policy Institute. Available at <<<http://www.ppic.org/publications/PPIC120/ppic120.html>>> .
- Simons, G.F., Vazquez, C. and Harris, P.R. (1993) *Transcultural Leadership: Empowering the Diverse Workforce*. Houston: Gulf Publishing.
- Stewart, E.C. and Bennett, M.J. (1991) *American Cultural Patterns*. Yarmouth: Intercultural.
- Stober, D. and Hoffman, I. (2001) *A Convenient Spy: Wen Ho Lee and the Politics of Nuclear Espionage*. New York: Simon & Schuster.
- Tang, J. (1993) 'The career attainment of Caucasian and Asian engineers', *Sociological Quarterly*, 34(3): 467-496.
- Tang, J. (1997) 'The model minority thesis revisited: (counter) evidence from the science and engineering fields', *Journal of Applied Behavioral Science*, 33(3): 291-315.
- Tang, J. (2000) *Doing Engineering: The Career Attainment and Mobility of Caucasian, Black, and Asian-American Engineers*. London: Rowman & Littlefield Publishers.
- Trompenaars, F. (1998) *Riding the Waves of Culture: Understanding Cultural Diversity in Global Business*. New York: McGraw Hill.
- US Bureau of Labor (2000) *Bureau of Labor Statistics*. Washington, DC: US Government Printing Press.
- Varma, R. (2001) 'Asians in the US public service: diversity, achievements, and glass ceiling', *United Nations Expert Group Meeting on Managing Diversity in the*
-



- Civil Service*. Available at <<<http://unpan1.un.org/intradoc/groups/public/documents/un/unpan000869.pdf>>>.
- Watanabe, M.E. (1995) 'Achievers demonstrate that success in science can come despite barriers', *The Scientist*, 11(4): 6-7.
- Wong, P. and Nagsawa, R. (1991) 'Asian American scientists and engineers: is there a glass ceiling for career advancement?', *Chinese American Forum*, 6(3): 3-6.
- Woo, D. (2000) *Glass Ceilings and Asian Americans*. California: AltaMira Press.
- Wu, D.T.L. (1997) *Asian Pacific Americans in the Workplace*. California: AltaMira Press.
-