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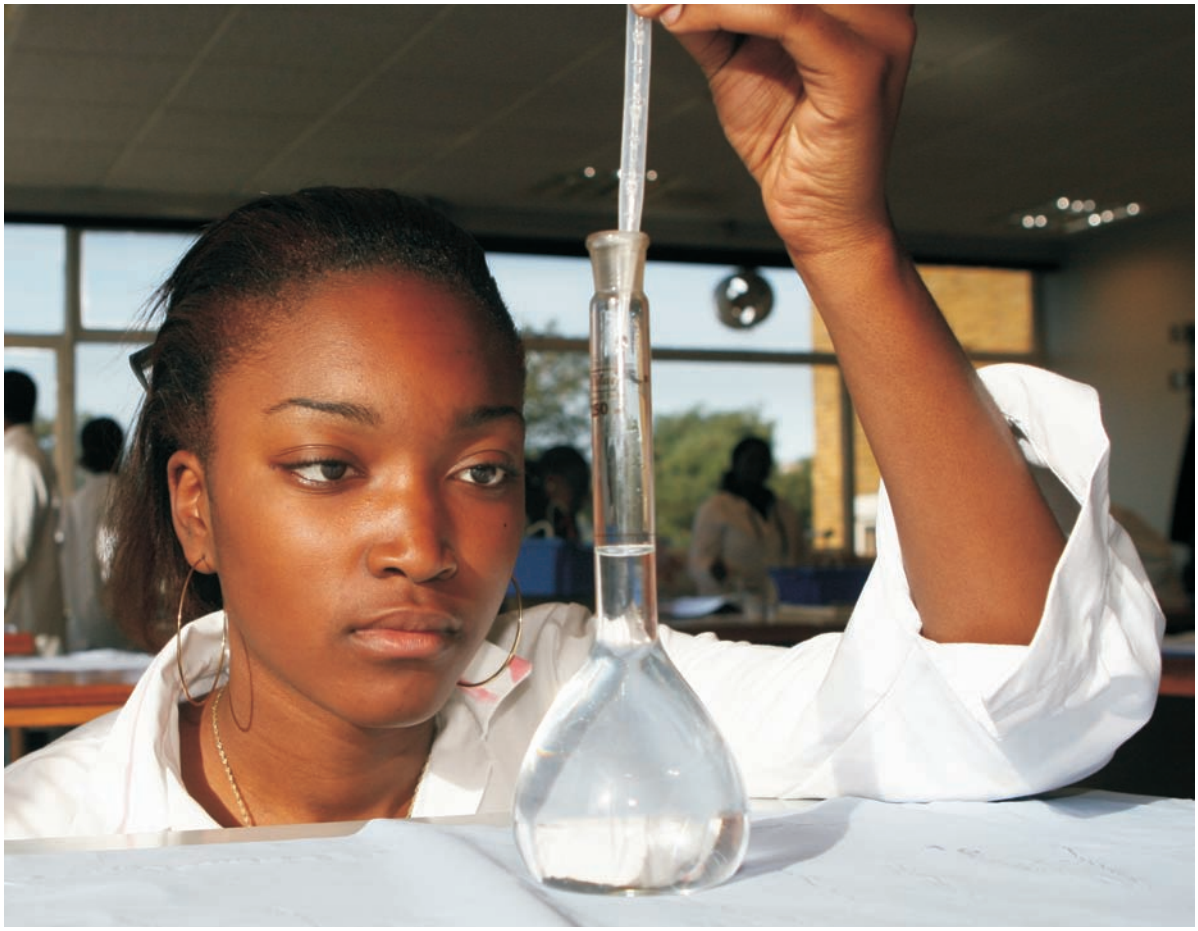

OPPORTUNITIES FOR REFUGEE ENGINEERS

By Linda Rabben

INTRODUCTION

Tens of thousands of refugees, asylees, and parolees resettle in the United States every year. In FY 2008 alone, 60,279 refugees were resettled by 10 national voluntary agencies. All make lives for themselves in cities, towns and suburbs across the country, and all strive for the same thing: opportunity. Many of these newcomers bring a few reminders of home, their families if they are lucky, and their past experience. This experience is vast and varied. Now more than ever, most resettlement agencies are greeting individuals at the airport who are physicians, lawyers, teachers, professional interpreters, engineers, and so on.

In a recent survey conducted by RefugeeWorks, at least 74 percent of resettlement agencies around the country had one or more physicians in their caseload. About 25 clients per agency are seeking recertification in their previous occupation. These people represent an enormous amount of human capital. However, the issue for many of these new Americans is that they do not know how to navigate the employment and advancement systems in place in their particular profession; nor can they wait the years required to obtain recertification. How does a teacher from Nepal obtain a job in education? How does a doctor from Iraq get into the medical field?

In the months ahead RefugeeWorks will create a series of in-depth guides that can be used to help newcomers regain their professional career. The first of the series focuses on engineering: the future of the profession, the skills, credentials and training needed to enter this line of work—and most important, how to find employment in one of 20 engineering specialties.

If you are someone who is working in the field of refugee resettlement, we urge you to use this research to help your clients navigate what can sometimes be a perplexing road to regaining entry into a particular profession. If you are a new American seeking to use your skills in your chosen occupation, we hope this will make your journey a little easier.

Jonathan Lucus
National Coordinator, RefugeeWorks

A REFUGEE ENGINEER IN THE UNITED STATES

Muhammad fled to Syria from Iraq after he was shot by insurgents during a kidnapping attempt. He was targeted because he had worked as an engineer for American forces. While in exile he met Yasmin, also an engineer, whom he married. In October 2008 they came to the United States as refugees.

Life is hard for them with the modest assistance they receive through their resettlement agency. They live in a small apartment in a far-off suburb and take the bus everywhere. The round trip on two buses each way to the community college where they study English costs $7. The rent is paid for only three months, as are utility and telephone bills. They are scheduled to receive $500 assistance from the municipal Office of Home Energy Programs, but their most recent electricity bill was $116. For recreation they visit the park and feed the birds.

Refugee engineers are already in the United States, eligible to work immediately and likely to remain here permanently.

After six months in the United States and numerous unsuccessful job applications, Muhammad found work as a technician at a Sears appliance repair shop with the help of their resettlement agency. Yasmin plans to apply for jobs teaching Arabic. Yasmin's dream: "In five years I will have my own home. My husband and I will have master's degrees in engineering, and I will have my own restaurant."

THE ENGINEERING PROFESSION

An engineering professor has described engineering as "an under-examined, under-scrutinized and poorly understood profession" (Morgan 2006: 3). An engineering-school dean says engineering is more "egalitarian" than other professions, putting up fewer barriers to employment. Engineering is one of a few

professions that do not require an advanced degree. Even a young, inexperienced applicant without a bachelor's degree in engineering can find an engineering job, depending on the contacts he or she can muster. Networking, the dean stressed, is crucial to advancement in the profession. Lack of diversity is a longstanding problem, however, with relatively few women and minority group members going into engineering. Nevertheless, a significant proportion (more than 40 percent) of engineering PhDs in the United States is foreign-born, especially but not exclusively in information technology. For these reasons newly arrived refugee engineers may find opportunities to obtain employment in their field.

University schools of engineering typically list from 12 to 20 specialties in their course catalogs. These range from mechanical to nuclear, biomedical and environmental engineering. (See the appendix for a list of specialties.) Foreign students keep many engineering graduate programs afloat. Employment and advancement prospects vary considerably among the specialties. Some areas are growing fast while others are shrinking or stagnant. According to one study, the profession has "significant schisms" and is "fractured by discipline" (Morgan 2006: 68). Because of this decentralization, it is impossible to delineate one path to recertification in the profession. Numerous professional societies, associations and academies represent and advocate for engineers, administer professional exams and continuing education courses, and (in some cases) provide professional certification. However, in 1998 only about a third of engineers had a license or certificate, and only half of working engineers belonged to a professional society.

As a result, many engineering jobs are filled by people without specialized training. In 1998 a member of the Engineering Workforce Project observed, "The holes get filled in with people with the relevant skills, and ever since the end of the Second World War there has been a constant stream of people from countries in conflict who have moved to the United States and in many cases become citizens doing valuable jobs" (Morgan 2006: 6). This strong tradition has been threatened in recent years by outsourcing, offshoring and resulting resentment among native-born engineers. They feel excluded from professional opportunities by younger immigrants who come to the United States on temporary work or student visas and later return to their home country. However, job developers can educate engineering employers by emphasizing that refugees are allowed to work legally in the United States without visas, and they are unlikely to return to their home country.

White males are likely to be replaced by younger women and minority group members, including immigrants.

Meanwhile, increasing numbers of immigrants are filling jobs in information technology and other engineering specialties. In 1998 Congress raised the immigration quota for temporary skilled workers. This policy brought younger, foreign engineers to the United States and may have displaced older, native-born engineers. In the early 2000s foreign-born engineers comprised "a significant percentage of all chemical, civil and electrical engineers," according to the STEM [Science, Technology, Engineering and Mathematics] Workforce Data Project (Lowell 2005: 2).

ENGINEERING WORKFORCE COMPOSITION

In 2006 the U.S. Bureau of Labor Statistics reported about 1.5 million engineers employed in the field. About 256,000 worked as civil engineers and 227,000 as mechanical engineers. Industrial engineers held about 201,000 jobs; electrical engineers about 153,000 jobs. Some 300,000 engineers worked in 13 other specialties. A large "miscellaneous" category totaled 170,000. More than a third (37 percent) worked in manufacturing; 28 percent were in professional, scientific and technical services. Engineers also worked in construction, telecommunications and wholesale trade. Federal, state and local governments employed 12 percent of engineers. Only 3 percent were self-employed.

In recent years the highest employment rates for science and engineering employees have been in Boulder, Washington, DC, Seattle, Boston and San Francisco. Foreign-born IT workers are concentrated in six states where information technology is an important industry: California, New York, Illinois, Virginia, Florida and Massachusetts.

Like many other professions, engineering is an aging one. In the coming years hundreds of thousands of engineers will retire, and many worry that native-born engineers will not be available to replace them. Fewer young people are studying engineering in the United States, as other professions, such as medicine and the law, promise higher salaries and better prospects for advancement. This is true not only in the United States. An international study found that "in many countries, interest from traditional secondary school students in engineering as a study and career option has waned, while demand from mature-age lifelong learners seeking to upgrade their trade, technical or other qualifications and enter the professional sphere of the engineering workforce has increased" (Palmer and Hall 2008: 1).

Innovativeness, entrepreneurship and international knowledge and experience are valuable qualities for engineers.

In addition, many engineers take management positions that have little to do with their training and prior experience. Older engineers are increasingly hard to find, and there is evidence of age discrimination in fields that are undergoing constant change. Older engineers lose professional opportunities if they remain unemployed for a long time because they are thought to become "deskilled." Economic downturns since 2000 have forced many out of their specialty or even out of the profession. Some had to settle for lower-paying jobs; others retired. As white males, who have traditionally constituted the majority of engineers, retire from managerial positions, they are likely to be replaced by younger women and minority group members, including immigrants.

Meanwhile, many firms have taken advantage of the H1-B visa program to hire well-qualified and highly educated foreign engineers at lower wages than their U.S. counterparts receive. When temporary visas expire (after a maximum of six years), some companies send the foreign engineers back to their affiliate in the home country, having trained them to do jobs abroad that native-born engineers had done in the United States. This is the aspect of offshoring that has aroused particular disquiet among native-born professionals. However, they can be assured that refugee engineers do not need sponsorship or an H1-B visa to work legally in the United States.

THE FUTURE OF THE ENGINEERING PROFESSION

In his 2006 report, "The Impact of Offshoring on the Engineering Profession," Robert Morgan concludes, "The future of the profession is murky." Some things do seem clear, however. Downsizing in the United States since 2000 has created a shortage of skilled and specialized workers. Twenty-two percent of respondents to Manpower Inc.'s 2008 Talent Shortage Survey said that engineering positions were the hardest to fill, and Duke University reported that 30 to 40 percent of students in its Masters in Engineering (MEng) management program had accepted jobs outside engineering. One-third of MIT's engineering graduates leave the field. Highly qualified and well-educated engineers are now graduating from universities in China and India, then coming to the United States for additional training and jobs. The main thing stopping more foreign-born engineers from migrating to the United States has been the increased difficulty since 9/11/01 in obtaining a visa. But as a result of globalization the overall trend is for the increasing mobility of human capital. Thus foreign-born engineers will continue to migrate here, and U.S. companies will also send engineering jobs to India, China and other countries in the coming years. Right now about 15 percent of such jobs are outsourced abroad. Because of greater competition

between developed and developing countries, in the future the United States may not be the preferred destination of foreign engineering graduates. This trend may create a competitive advantage for refugee engineers, who are already in the United States, eligible to work immediately and likely to remain here permanently.

According to the Bureau of Labor Statistics, although engineers have been "traditionally concentrated in slower-growing or declining manufacturing industries," some engineering specialties were expected to grow by at least 11 percent from 2006 to 2016. Others, such as environmental engineering, may grow 20 percent or more by 2016.

As a significant proportion of the U.S. engineering workforce heads toward retirement, some specialties will experience serious shortages. For example, railroad engineering, an applied area of the profession staffed mainly by civil engineers who have worked in the field for decades, will need to grow considerably in the coming decades.

To ensure international competitiveness, one study (Regets 2008) recommended that the U.S. engineering profession encourage the development of management, knowledge integration, entrepreneurial, cross-cultural and other "soft" capabilities and encourage the immigration of highly skilled workers. Refugee engineers with such capabilities may have an advantage in finding jobs.

SKILLS, TRAINING, CREDENTIALS

Usually engineers have a bachelor's degree, although some research positions require graduate training. Most degrees are in electrical, electronic, mechanical or civil engineering, but graduate engineers often work in specialties outside the field in which they trained. Universities and community colleges also offer engineering technology (ET) degrees, and those graduates are considered to be midway between technicians and engineers. Engineers with advanced degrees—MSc, MEng or PhD—may work on more theoretical problems in an office or laboratory, while BSc recipients tend to work on applied or practical problems in the field. Engineers with doctorates also teach at universities and community colleges.

Innovativeness, entrepreneurship, and international knowledge and experience are valuable qualities for engineers in rapidly changing and growing areas such as information technology. Foreign-born IT workers are especially well-educated. According to the IT Workforce Data Project, 40 percent have completed an advanced degree, and they often have more years of formal training than native-born workers.

Networking is essential for successful job hunting in the engineering field.

According to the 2003 SESTAT (Scientists and Engineers Statistical Data System) survey, more than half of all doctorate holders in engineering and computer science, and 57 percent of doctorate holders in electrical engineering, are foreign-born. The survey found that foreign training is now as good as or even better than that received at many American institutions. The survey concluded that to remain internationally competitive, the United States must reduce barriers to the entry of highly-skilled workers and help them stay in this country. Refugee engineers are the most likely to remain here.

Universities and professional societies have established task forces and commissions to recommend ways to attract and integrate young people, women and members of minority groups who are underrepresented in the engineering workforce. Refugee engineers have received little or no attention from these bodies, however. Educational and professional institutions, as well as employers, need to be informed and educated about refugee engineers' talents and availability.

Engineers with advanced degrees earn higher salaries, but most engineers (59 percent) working on research and development have BSc degrees, and some have degrees in other disciplines. Applicable work

experience and evidence of creativity may be more important than educational credentials in this field.

To remain competitive, engineers must "continue their education throughout their careers because much of their value to their employers depends on their knowledge of the latest technology" (Bureau of Labor Statistics 2008). For this reason it might be advisable for refugee engineers with foreign degrees to take additional courses in the United States, especially in fast-growing areas such as biomedical and environmental engineering.

Licensing requirements for engineers vary considerably by state and specialty. Refugee engineers and service providers should consult professional and state government Web sites to determine whether a qualifying exam, license or certification will be necessary. Note: Security clearance for some engineering positions, particularly with the U.S. government and contractors, is usually available only to U.S. citizens.

HOW TO FIND AN ENGINEERING JOB

- **Networking**. In a profession fragmented by specialization and lacking consistent professional requirements, employers exercise considerable discretion in making hiring decisions. As a result networking is essential for successful job hunting in the engineering field. Job seekers must "sell" their qualifications, experience and talents, not only to human resource personnel but also to intermediaries and mentors who can advise and inform them about job opportunities. Initiative, persistence and skillful self-presentation are important qualities for job seekers, not only in engineering but in all professions.

- **Self-Presentation**. American cultural norms for self-presentation may be very different from those in the refugee's home country. Mock interviews and exercises in meeting and greeting should be helpful to the refugee job seeker. Mentors can also give good counsel and feedback.

- **Résumés**. Résumés should be tailored to demonstrate specific accomplishments in the field as well as educational qualifications. The job seeker should be prepared to present a résumé at job fairs and networking events and to consult it during telephone screening interviews.

Biomedical, environmental and industrial engineering will grow by 20 percent or more in the coming years.

- **Training.** Applying for a license or certificate can be time-consuming, complicated and expensive. In the meantime engineers may want to take courses in a new specialty or enroll in an engineering technology program at a community college or university. Engineering technologists "apply current knowledge and practices to the solutions of specific technological problems and standard design problems. . . . They are most likely to get a 'hands-on' laboratory, testing, construction or in-the-field job" (Rowe and Laskowski 2006). No matter what specialty an engineer may already practice, education is a good long-term investment and provides an opportunity to update knowledge and improve vocational language skills.

- **University Employment**. A technical or other job at a university may include free courses, since many offer tuition benefits to employees. University employment also provides opportunities to interact with potential colleagues, mentors and employers. Engineers who come to the United States with a doctoral degree may want to investigate post-doctoral research appointments at universities and research institutes. These positions are temporary and pay less than work for a private employer, but they do provide a living wage, opportunities to do advanced research and relevant professional experience.

- **Growth Areas**. Certain engineering specialties are growing fast in the United States. According

to the Bureau of Labor Statistics, biomedical, environmental and industrial engineering will grow by 20 percent or more in the coming years. Engineering management, computer and information system management, computer programming, computer software, engineering technology and sales engineering are other growth areas. Engineering jobs that are unlikely to be outsourced abroad include research, conceptual design, project management, business analysis, architectural design and jobs requiring a security clearance.

In the United States the Engineering and Science Career Network links online job boards of some 20 professional associations, including the American Society of Civil Engineers and the Biomedical Engineering Society.

Initiatives in other countries that help refugee engineers could serve as models for U.S. service providers. For example, the Refugee Engineers Database (RED) in Britain provides information on job vacancies, training, work placements and sponsorships. A large coalition of engineering societies, social service agencies and mutual assistance associations collaborates in this effort, started by a Rwandan refugee. Web sites helping refugee engineers and other professionals in Britain include the Employability Forum (www.employabilityforum.co.uk), Refugee Access (www.refugeeaccess.info), Education Action International (www.education-action.org) and PRESTO (www.prestopartnership.org.uk). Databases and Web sites could be valuable resources for refugee engineers, service providers and employers in the United States. Refugee IT professionals in this country should be encouraged to create and maintain them.

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APPENDIX: ENGINEERING SPECIALTIES TAUGHT AT MAJOR U.S. UNIVERSITIES

Aeronautic
Aerospace
Applied Mechanics
Architectural
Biological & Environmental
Biomedical
Chemical
Civil & Environmental
Computer Science
Control & Dynamical Systems
Electrical
Engineering Education
Engineering Management
Engineering Mechanics
Engineering Physics
Geological Sciences
Industrial
Macromolecular
Materials Science
Mechanical
Mining & Minerals
Operations Research & Information
Software
Systems
Telecommunications

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LINKS

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Employability Forum. www.employabilityforum.co.uk.

Engineering and Science Career Network. www.engineeringandsciencecareernetwork.com.

London Development Agency. www.lda.gov.uk.

Refugee Access. www.refugeeaccess.info.

Refugee Engineers Database. www.refugee-engineers.org.uk.

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LUTHERAN IMMIGRATION AND REFUGEE SERVICE
700 Light Street, Baltimore, Maryland 21230