Science in Translation, by Scott L.Montgomery. Chicago: The University of Chicago Press, 2000, 325 pp.

Part I of *Science in Translation* is a historical tracking of the journey taken by translation of scientific knowledge starting in ancient Greece and moving initially to Rome in the west and the "Arab World" in the east and secondarily from the "Arab World" in the east back to Europe in the late middle ages starting about 1100 A.D.

Part II of *Science in Translation* is a tracking of the journey in the non-Western world, all of the major technological powers in Asia today, a migration that started in the early 17th Century but had its major impetus in the 19th Century. It is a journey of more than 2000 years. It is a journey that has seen science grow, develop, and spread over the face of the earth, a process that has been made possible by translation.

The author asks, "how is knowledge rendered mobile?" What makes it able to cross boundaries of time, place, and language? He answers, "as the second oldest profession on the streets of authorship, it is generally conceived in fairly obvious terms as a matter of rendering the words of one language into those of another, hopefully with little or no spillage of meaning. Yet this is more in the manner of description. It deals not at all with the enormous variety and complexity of the transfer itself." This book deals with the who, where, why, and when of translation, as well as the what and the how. Who were these translators? Where and when did they live and work? What is their legacy? How did they do it?

According to Montgomery, these translators came from all walks of life, "monks, scholars, mercenaries, students, explorers, soldiers, ship captains, commercial journeymen, diplomats, scribes to name but a few." Apparently, all were male. Who they were describes where they did it.

When did they do these translations? Although translations were always being done, the migration of translations from the Greco-Roman world to the east began in the 5th and 6th Centuries A.D. The author states, "The group of secondary Aristotelian works had its own fate. During

the 5th and 6th Centuries, it moved east, as a result of persecution Nestorian scholars endured under the Byzantine emperor." This marked the time when translation went from Greek to Hebrew, Syriac, Coptic and into the "Arab World", or when it moved east rather than west.

Translators carried out their task for various reasons including: pedagogic, use, nativizing foreign science, establishing libraries, status, political and religious reasons, etc.

How did they do it? They did it in every conceivable way. One person with the understanding of two languages would certainly be capable of undertaking a particular translation. But there are other methodologies. According to Montgomery, "today, we tend to think of translation as requiring profound expertise in a foreign language. History shows this to have been the case less than half the time over the last two thousand years. Some of the most outstanding translations in all of Western history- Gerard of Cremona, for example, who brought into twelfth century Europe dozens upon dozens of the most difficult scientific texts from the Arabic… appear to have used intermediaries on a fairly regular basis." For example, a translator desiring to produce a translation from Arabic to Latin would hire someone, an interpreter fluent in vernacular Italian and Arabic, to translate from Arabic to vernacular Italian. He would then listen to the vernacular Italian coming from the interpreter and record into vernacular Italian on paper. He would then translate what he had written in vernacular Italian into Latin.

What was their legacy to us? The gifts of the translators are best described by the story that I excerpt from *Science in Translation* and which I paraphrase.In the middle of the third century B.C. Demetrius Phalereus, student of Aristotle, escaped Athens to become head of the great library at Alexandria. The central mission of the "Universal" library was to bring to Alexandria the books of all the peoples of the world. Demetrius believed that the books of Jewish history, law, and philosophy should be part of this library. Ptolemy Soter I of Egypt, drawing descent directly from Antipater, successor to Alexander the Great, ordered it done. The relevant works, however, required translation: they

were not written in Coptic or Greek or Phoenician, nor in Syriac, as commonly believed, but in Hebrew. Translation was not a problem for the great library. Ptolemy put to work seventy-two Jewish scholars, six from each of Israel's twelve tribes. These men came west to the small island of Pharos, where, in elegantly furnished and protected isolation, they completed their work in seventy-two days. This tale illustrates that translation started early and that the material was *Philosophy* that abridged not only science but the beginnings of all "Western thought." The reader will discover that Montgomery mentions in his book "the great library with its dream of gathering the knowledge has never died"; *Ptolemy Almagest* on astronomy; *Galen* on logic, botany, cosmology; the formation of Arabic science from the eighth through tenth centuries, *Al-Kindi* on his great works on Euclidean optics; *Gerard of Cremona* with the help of his assistants and students, was a university of textual material, nearly all of it crucial to the development of Western science there after. That is what they gave us, our legacy.

Scott L. Montgomery takes us on a voyage from ancient Greek script through Syriac to Arabic, Hebrew and Georgian to Medieval Latin to French, German, English then to Japanese. Meanwhile he discusses the theory of translation, and the cultural and religious implications.

Montgomery is a geologist, writer, scholar, and translator. Unlike a simple practitioner of applied science, his fields of expertise make him always look back at the history of his endeavor. His book is a well-documented, scholarly work that could only have been done by a detective, archivist, translator, geologist, and scholar. He uses astronomy to show how a science started by the ancient Greeks was translated to Arabic and grew over six centuries before being translated back into twelfth-century medieval Latin to come into the flow of Western thought. The same might be said of all sciences in the hands of the eastern "Arabic" thinkers. One of the high points of this book is the scholarly illustration that the history of Western thought is not a straight line west from Greece to Rome to Europe, but rather a detour to the middle east where it reverberated, grew, and developed in an Islamic culture.

Part II of the book, Science in the non-Western World is a record of more recent matters- the introduction of science to Japan. Before the visit of Commodore Perry in 1853, Japan had been pretty much an oral culture that lacked a unified script and totally lacked oral and script symbols of science. Jesuit missionaries had attempted to introduce Western concepts into Japanese culture as early as 1600. Japan's ban on Western books began in 1630. In the latter half of the 19th Century, Japan took on a national effort to modernize and "the new technical power of the state had been proven, in no uncertain terms, by Japanese wartime victories over both China (1894-1895) and Russia (1904-1905)..."

The rapid assimilation of technical script vocabulary into the Japanese language and all the cultural, political, and philosophical changes required to bring this about are discussed in part II of the book. The advent of the technical idiom from Islamic culture in the east to European languages took six centuries. With the concerted national effort in Japan it took only fifty years to acquire the language for change and the scientific modernization of a nation.

This book is about script translation and does not consider other forms of translation (translation without language). One possible criticism of Montgomery's work is its failure to consider other forms of translation. On the other hand, this might be considered a plus because it is food for thought in terms of the total picture of information transfer. My own training as a physician, for example, included large segments of non-verbal information transfer. Many surgical procedures are learned without a word being read or spoken. Watch one, do one, teach one, is the method. It would not matter if the instructor spoke Greek and the student understood only English. The storehouse of this information is not paper and ink, but the human brain. Many of our surgical procedures have their antecedents in ancient medicine. In keeping with the concept of visual, non-verbal translation is the question: which came first, the technology or the science in the transfer process? The plains Indians of North America became an equestrian culture with the gift of the Spanish horse. They were not afforded an instruction manual. Did the stonemason of Macchu

Picchu have a written language? It would seem that there are two parallel systems for transferring science over time and cultures. One is the continuous line of human brains fed information on many levels both verbal and non-verbal, and the other system of written language. A written manuscript is but a reflection of the state of the art and science housed collectively by humanity at any point in time.

This criticism notwithstanding, *Science in Translation* is a well-documented scholarly work that is fascinating. I recommend it for all retired practitioners of applied science and for any scientist who wants some good reading while on a short vacation. I say retired person because while during the "rat race" of student life and the pace of engineering practice a person doesn't have time to study the history of science: one learns the current state of the art. He knows exactly where he is but doesn't know how he got there. That is to say, we are wealthy with knowledge, but don't know our benefactors. Practicing science is rewarding, but knowing one's heritage is equally rewarding. This book is not for a college freshman or sophomore. It is for someone with a background in science, history, or self-education.

Bernard C. Musselman
St. Lawrence University