spain-2007-06.txt, Ralph Abraham, March 20, 2007

GRANADA

*** Sunday, March 04, 2007.

We saw from the hotel the Alhambra in the foreground, the whole of the city of Granada below, and the Sierra Nevada, standing white in the distance. These mountains, like our Sierra Nevada in California, provide excellent skiing on spring snow. During our visit, the FIS World Championships were ongoing there. Given just one more day here, I could have gone skiing!

This was the day for my third talk to the students. I told the story of "the football" -- how Proclus in Late Antique (5th century) Greece wrapped Euclid's Elements into a time capsule, and threw it like a football into Medieval Europe. This involved camel trains and sail boats along spice routes to India, to the Persian (now Turkmenistan) oasis of Merv on the Silk Road, once the largest city in the world, and on down to Baghdad, to the newly founded Bayt al-Hikma, or House of Wisdom, where it touched down briefly around 815. Then back on the road to Cordoba, and on to newly reconquered Toledo, where it was rendered into Latin in 1109, by Adelard of Bath.

*** Monday, March 05, 2007.

This was the day for the long awaited first visit to the Alhambra, the greatest extant Islamic palace, of the 11th to 15th century. From here was expelled, in 1492, Boabdil, the last of the Andalucian emirs. Before leaving home I had read three books on The Alhambra: one by Washington Irving of 1852, another by Oleg Grabar of 1978, and another by Robert Irwin of 2004. I had also read nine volumes on the geometry of Islamic patterns, which reached their highest expression in the Alhambra.

And here, at 3:30 in the afternoon, we stood, with two excellent guides. It would take weeks to fully explore and study this marvel, we had just a few hours. Although I focused my attention primarily on the two- and three-dimensional patterns, there was also much to learn from the geometry and evolution of the basic architecture. The book of Abas and Salman seems to me the best on the two-dimensional patterns, while that of Grabar is the most interesting on the architecture.

We also explored the Albayzin, or old Islamic quarter, the archeological museum, and the Real Capilla (Royal Chapel, the burial place of Ferdinand and Isabella).

*** Tuesday, March 06, 2007.

My fourth talk to the Ross group. This was my teaching on the two-dimensional

Islamic patterns, for which I had done so much preparation. For once, I had prepared a Power Point presentation (Keynote actually) and a "textbook", pages 57-66 of "Symmetries of Islamic Geometrical Patterns" by Abas and Salman (1995). In order, I introduced Cartesian coordinates and the distance function for the Euclidean plane, the definition of an isometry of the plane, the symmetries of a pattern (subset) of the plane, and symmetry groups. As an example, I discussed D8, the dihedral group of a square. And I assigned homework: to show that D8 is a group, to determine the symmetry group of an equilateral triangle, and that of an Islamic pattern.

This was followed by a second visit to the Alhambra, again at 3:30 in the afternoon, and then a study hall devoted to the homework problems. All the students worked hard on homework. Not all this work was focused on the assigned problems, but I was amazed, for the second time, by the capabilities of these students. Modern group theory was not at all beyond their grasp. (The first amazement was after the study hall in Sevilla, devoted to NetLogo models for Andalucian cultural history.)

*** Wednesday, March 07, 2007.

Day of rest for the students. Courtney, Carla, and I visited the archeological museum and the synagogue.

*** Thursday, March 08, 2007.

On to Madrid!

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