Proposed High-level Regional Focal Points for Lunar Geography Charles J. Byrne, Image Again, Middletown, New Jersey; cjbyrne@monmouth.com.

Introduction: It is difficult to grasp a good mental image of the major features of the moon in terms of their global distribution and relationships. There is no equivalent of the organization of terrestrial geography in terms of continents and oceans that are so useful in establishing a mental and visual image of Earth. This paper proposes a set of focal points and associated regions for the organization of images of the moon.

Existing Regional Groups: The distinction between the nearside and farside is of course a major organizing structure. In a sense it is accidental, depending on the synchrony of the Moon's rotation and its revolution around Earth. Yet we have found that the crust is thinner on the near side than on the far side, with important consequences to the nature and distribution of features. But views of the Moon at this level provide extreme distortion, especially at the limbs and poles, obscuring the true nature of features and their relationships. The separation of lunar landforms into mare and highlands is of some help, especially on the nearside, but does not provide a uniform distribution of regions around the lunar globe and there are too many maria and too extensive highlands to serve as good second-level regions.

A set of six Lambert equal-area projection views (North polar, South polar, nearside, farside, eastern limb and western limb) is considerably helpful. They allow us to visualize features in reasonably uniform scale, with minimal distortion and reasonably realistic depiction of the relationship between large features. However, the full set is rarely used, possibly because of the difficulty of the projection algorithm.

Proposed Regions: This note proposes a high-level list of 11 regions, centered on interesting, memorable focal points. They are chosen for broad distribution, to ensure roughly uniform coverage of the lunar globe. Each region is sufficiently small to support photographic and other images with reasonable distortion.

Basins were chosen as many of the focal points because they are major modifiers of the surface geology, not only through their central rings and mare but also through their ejecta blankets. Specific basins were chosen as much for uniformity of spacing around the lunar globe as for size or interest. In addition to basins, the North and South polar regions were included because of the special significance of the shadowed craters in those regions and also because the photographic quality is quite different. One region is centered on a crater and one on a highland region to complete the coverage. The proposed regions, and the latitude and longitude of their focal points, are:

Region	Latitude	Longitude
Orientale basin	19 S	95 W
Imbrium basin	35 N	17 W
Nubium basin	21 S	15 W
Nectaris basin	16 S	34 E
Crisium basin	17.5 N	58.5 E
Tsiolkovskiy crater	21.2 S	128.9 E
Moscoviense basin	26 N	148 E
South Pole-Aiken basin	56 S	180 E
Northern far side highlands	15 N	135 E
North polar region	90 N	NA
South polar region	90 S	NA

Table 1: Proposed regional focal points of the Moon and their coordinates. Regions other than the polar regions are listed from east to west, from Orientale across the near side and far side to the Northern far side highlands.

The great circle arcs between the focal point of each of these regions and of each neighboring region range from 34 degrees (center of the South Pole – Aiken Basin to the South Pole) to 91.5 degrees (Orientale Basin to Imbrium Basin).

The following sections summarize the characteristics and prominent features of each region. Only enough description is included to differentiate the regions from each other; these descriptions are not intended to be comprehensive, or to discuss the geology or stratigraphy of the regions in detail. No attempt is made to establish precise boundaries between the regions: that would be like attempting a precise boundary between the Atlantic and Arctic oceans. These regions are proposed to serve as a method to organize imagery, an alternative to lattitude and longitude, and no representation is made that they are of fundamental geologic or cartographic significance. The descriptions depend heavily upon material from Don Wilhelms [1] and Paul Spudis [2].

Orientale Basin: The Orientale basin, with its central mare and multiple rings, has been called the archetype of basins because it is both large and relatively recent. Consequently, its structure is very clear. The region includes the smaller Grimaldi basin and craters Schickard and Bailly.

Imbrium Basin: The Imbium basin and its ejecta blanket dominate much of the nearside. The region includes Oceanus Procelarum, which may represent part of a gigantic basin that preceded Imbrium and other neighboring maria: Vaporum, Serenitatis, and Frigoris. Craters in this region include Kepler, Copernicus, Archimedes, and Arisotelis. This entire region is rich in mare, ejecta blankets, and rays of craters. It also has a number of features (such as Schroter's Valley) that are associated with the flooding of the mare floors.

Nubium Basin: The Nubium basin region includes the Humorum basin and craters Pitatus and Tycho. This region is particularly interesting for understanding the interactions of different types of features such as the manner in which mare floors encounter crater rims and highlands. The Fra Mauro peninsula is an example of such a feature.

Nectaris Basin: The Northeastern part of the Nectaris region is rich in maria, including Fecunditatis and Tranquilitatis as well as Mare Nectaris. To the West and South, the region includes extensive highlands. To the West, parts of these highlands are covered from ejecta from the Imbrium basin.

Crisium Basin: This region includes the Smythii and Marginalis basins as well as Crisium. In this region, there is a transition from mare with inclusions of highlands, as in the Nectaris region, to highlands with inclusions of basins. This may reflect the thickening of crust under the farside.

Tsiolkovskiy Crater: Tsiolkovskiy is a large farside crater with a mare floor and a well-developed ejecta field. It overlaps larger, older crater Fermi. This region also includes the Australe basin, craters Humboldt and Gagarin, and intervening highlands.

Moscoviense Basin: This region is characterized by the Moscoviense, Mendeleev, and Humboltianum basins and their ejecta blankets, covering highland terrain.

South Pole – Aiken Basin: The basin that dominates this region is very large, very old, and very deep. It includes smaller basins like Apollo, Poincare, Planck, and Ingenii. Mare floors are patchy in this region, usually associated with the basins or craters inside of the South Pole – Aiken basin. Spectral measurements show a distinctive mineralogy of the regolith of the basin floor. The basin rim extends nearly to the South Pole. The southern part of the basin, including the Schroedinger basin, is proposed to be included in the South polar region, primarily because of the crater shadowing.

Northern Farside Highlands: The Clementine mission showed this region to be dominated by terrain at the highest elevation of the lunar surface. Interestingly, it is adjacent to South Pole – Aiken Basin, at the lowest elevations. The region includes the Korolev, Freundlich – Sharonov, and Hertzsprung basins. Herzsprung is largely covered by Orientale ejecta and could alternately be considered part of that region. The basins in this area are unusual in that they do not show evidence of mare formation, possibly reflecting the greater thickness of underlying crust.

North Polar Region: The heavy shadowing in both polar regions obscures both photography and passive spectral measurements, especially for the floors of basins and craters. The nearside part of the region and the North Pole itself are largely covered with ejecta from the Imbrium basin. The northern part of the farside is largely covered with smooth, light-colored plains material. Craters in this region include Nansen, Shackelton, and Anaxagoras. The region includes the Humboldtianum basin.

South Polar Region: The South polar region is dominated by the rim of the South Pole – Aiken basin and several smaller basins such as Schroedinger, Planck, and Bailly. Permanently shadowed crater floors in this region are believed to harbor deposits of hydrogen or water ice. Permanently sunlit crater rims nearby are proposed as sites for solar power.

References: [1] D. E. Wilhelms et. al., *The Geologic History of the Moon*, USGS Professional Paper 1348, US Government Printing Office, Washington, 1987. [2] P. D. Spudis, The Geology of Multi-Ring Impact Basins: The Moon and Other Planets, Cambridge University Press, 1993.