

Yupiaq Mathematics: Pattern and Form in Space and Place

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Sharing Our Pathways, Vol. 2, Issue 2

The Alaska Native people have always had a way of seeing and understanding patterns in the land (nuna) around them. They identified patterns in plants, rivers, weather, landforms, animals and the heavens. Upon the careful observation of patterns, they were able to make predictions for the future. This critical analysis involved the past histories, the present conditions and thus presented sensemakers for the future. This is the practice of ecopsychology at its finest. Everything that one needs to know about life and to seek freedom and happiness are found in Nature. As stated by Barry Lopez, the landscape becomes the mindscape and the mindscape becomes the landscape (1986).

For Yup'ik people, according to elders Joshua Phillip and Fred George, the various parts of the body were their measuring instruments. The outstretched arms became the measure for the length of a fishing net. The closed fist defined the opening of the blackfish trap. Other units of measure, such as one arm's length, the distance from the elbow to the tip of the index finger, the span between the thumb and index finger extended, stepping off to mark the diameter of the qasgiq and various combinations of these became the units of measure for tasks such as making clothing, tools and shelter. Consequently, the clothing people wore and the tools needed for hunting and trapping were made precisely to fit the dimensions of the user.

The women used precise patterns for making parkas and mukluks. The parka required the maker to look at the body of the person for whom it was to be made and to visualize proportions in body form (including bone structure and musculature) and size in order, for instance, to determine the number of ground squirrel skins needed. In sewing together

the skins, the sewer is reminded of the family history of the patterns, tassels, decorative designs, and the use of various furs, taking advantage of their beneficial qualities.

The Alaska Native people also had a numbering system (Lipka, 1994). For the Yupiat people, their numbering system used a base of twenty. Ten fingers and ten toes are needed to make a complete person. The digits are attached to appendages which are in turn attached to the body. The counting system was necessary for determining the number of furs needed to make an article of clothing. For example, it takes 45 squirrel skins or six otter skins for a man's parka. For netmaking, special wooden measuring tools were constructed, again using body parts to determine the width for different species of fish. However, there was no need to count the precise number of dry fish to last the whole winter. This was done by estimating how much storage area needed to be filled with fish to feed the family and dogs, provide for ceremonies and share with others. Always, they had to have food supplies beyond the immediate needs of the family. Sharing and reciprocity were key to their preparations. Thus, for the Yupiat people it was not necessary to quantify in precise numerical terms, but rather in proportional terms relative to size of family, time until next food supply would be available, weather conditions and nutritional uses of various foods.

The Alaska Native people had many geometric designs in the things they made such as utensils, fishtraps, weirs, clothing designs and ceremonial paraphernalia. Again, it was not necessary to quantify in terms such as surface area, degree, angle, volume and other numerical dimensions. Such information alone would be considered insufficient knowledge for you were also required to know the history of the design, its replication of a natural or spiritual form, the meaning of the color and the story behind the artifact.

The Alaska Native people also had no precise measurements for distance such as feet, meters and miles. Rather, distance was calculated qualitatively—measured more in terms of time and terrain than distance. The Yupiaq person would consider the mode of transportation, weather conditions, topography over which he would have to traverse, history of various sites that one would encounter along the way where food is available and, if traveling a great distance, where logical and safe rest areas were located. In considering the above, one can see that units of measure for distance alone would have rendered their knowledge incomplete and unreliable as a basis for moving from one place to another. The all-important knowledge of place would be lacking in the details that are necessary for the landscape to merge with the mindscape.

Space and time were thought of differently too. Space was a multi-dimensional place that the human, spirit and nature occupied at the same time. The self or consciousness was considered to be time and timelessness at the same time. One accomplished what needed to be done at the right time. There was a place and time for everything. Timing in drumming and singing was important, however there was no need for a metronome because it was implicit in the act itself. To pay attention to such a device would detract from the sacredness of song, beat, motion and story. The circadian rhythm of the universe was the sacred timepiece of the Native people.

Western mathematics and sciences, because of their emphasis on objectivity and detachment, introduce us to an abstract and lifeless world that has a tendency to set us apart from the rest of our relationships in the universe. However, with fractal geometry and the new sciences of chaos and complexity, the Western thought-world seems to be shifting from the quantitative and impersonal study of tangible “things” and is becoming more attuned to the qualitative dimensions as more and more of its members recognize the importance of inter-relationships (Capra, 1996). Western scientists constructed the holographic image which lends itself to the Native concept of everything being connected. Just as the whole contains each part of the image, so too does each part contain the makeup of the whole. The relationship of each part to everything else must be understood to get the whole picture (Wilber, 1985). We are finally getting there.

There are many bright Native people who would make excellent elementary or high school teachers. Many of these students have problems understanding mathematics, in part because teachers don't themselves recognize it as another way of knowing with a language and logic of its own. We present mathematical abstractions as though the purpose was to practice the virtuosity of the human mind and its creativity and we lose sight of its practical applications. Native students often have trouble visualizing abstract mathematical constructs and their application to real life. Perhaps, we can overcome this problematic academic gatekeeper by introducing Native students to recognizing and understanding the patterns and forms in their own world through which they can visualize the problems and then move from qualitative to quantitative explanations. From the tangible we can go slowly into the intangible. The interest that such an approach can spark is evident in the work of the Inupiaq students from Kaktovik, who have created their own system for representing Inupiaq numerals (Bartley, 1997).

We are in a modern world which was described ably by Lewis Carroll in *Alice in Wonderland*: “Now, here, you see, it takes all the running you can do to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!”

New information is bombarding us from all quarters with entropy setting in and the decay of knowledge brings about confusion. It behooves us then to slow down and see what knowledge and information will help us to build the kind of world that we would like. What aspects of mathematics and the sciences will help free us from the obsession with self and materialism? We can learn from the way our ancestors made sense of the world and used keen observation of patterns and form in relation to space and place to maintain balance between the human, natural and spiritual worlds. You see, our problem is a crisis of consciousness. Ralph Waldo Emerson once wrote, “Society is in conspiracy against the manhood of every one of its members. Society is a joint-stock company in which the members agree, for the better securing of his bread to each shareholder, to surrender the liberty of the eater.” We experience resistance to making change in the world, but our efforts must continue with spirit and determination.

References

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