

ANCESTRAL SCIENCE PODCAST

SEASON 2: Episode 6 (audio/video)

with **Dr. KAMUELA YONG**

“Wayfinding through Relational Trigonometry of Stars, Swells, and Spirit”

We were grateful to speak with Dr. KAMUELA YONG, a Native Hawaiian mathematician about how mathematics is all around us, calculating latitude by North Star angles, moving islands and the law of cosines, wingspan measurements, Kāuna-number systems, and sea swells as the constant drum beat of navigation.

Remember, you can support the pod and rock some unique Indigenous Science merch at www.relationalsciencecircle.com/shop, all proceeds go towards Knowledge Keeper honoraria, following protocols, and keeping the pod going.

SHOWNOTES:

What is Science to you?

- the process of asking yourself *why*?
- it is about self discovery and relates to the world around us.

Importance of Indigenous/Native/Ethno mathematics:

- to have someone teaching the class the “looks like them”
- to highlight the depth of mathematics within Native Hawaiian cultures
- to be able to explore *more* of these mathematical knowledges within these cultures
- culture makes math interesting!
- ethnomathematics solves real-world problems

Native Hawaiian Math:

- connecting inverse trigonometry with stories of Maui, the sun, and the connections between the horizon and the mountains.
- but Native knowledges cannot be standardized to different places, they are deeply connected to that community and those lands.

Navigation:

- sailing has a depth of mathematics, but it also has a depth of relationality.
- <https://hokulea.com/about/>
- you sail with the clouds, the swells, the stars, and spirit, there is more to sailing than just trigonometry.
- using your “wingspan” when coiling ropes on the canoe. This is relational mathematics as it depends on your height/wingspan
- the waves/swells are the most constant variable when navigating the sea. They are like the consistency of the beating drum

Kamuela's work:

- “A mathematical model of the interactions between pollinators and their effects on pollination of almonds” <https://iro.uiowa.edu/esploro/outputs/doctoral/A-mathematical-model-of-the-interactions/9983776972702771>
- “From bee species aggregation to models of disease avoidance: The Ben-Hur effect” https://www.researchgate.net/publication/282905685_From_bee_species_aggregation_to_models_of_disease_avoidance_The_Ben-Hur_effect
- “Modeling the Biodiversity Effects of Water Diversion in Hawaii's Streams” https://www.researchgate.net/publication/268101520_Modeling_the_Biodiversity_Effects_of_Water_Diversion_in_Hawaii's_Streams
- <https://www.kamuelayong.com>

Indigenous Mathematicians:

- Kamuela wanted to better support and connect Indigenous mathematicians “because there aren't many of us”
- this work can get very lonely, we need to support one another.
- <https://indigenousmathematicians.org>
- <https://www.sacnas.org>

Wa'a Math:

<https://www.kamuelayong.com/waamath/chapter-title>

<https://www.kamuelayong.com/trigonometry/index-1>

Etak: Moving Islands (Micronesia)

- https://www.kamuelayong.com/trigonometry/law_of_cosines.html#p-2994
- Law of Cosines
- Micronesian navigators sailed using ancestral knowledges of the islands and seas. They knew the relatively position of the islands at the beginning, middle, and end of their journey. They mapped their journey based on how the islands moved around the *stationary* canoe.

Star Compass:

- https://www.kamuelayong.com/waamath/star_compass_construction
- <https://archive.hokulea.com/navigate/stars.html>
- <https://www.manoaheritagecenter.org/wp-content/uploads/2022/02/Hawaiian-Star-Compass.pdf>
- 32 ropes on the compass
- each section represent a “house”
- calculate latitude based on the angle of the North Star to the horizon

Hawaiian Counting Systems:

- wingspan and the ratios of anchor line to water
- wingspan and height

Kāuna- Number System:

- base-4
- based on the spaces between your fingers, and how many fish you can bring back from the fish farms

Gratitude to the support from JUAN-CARLOS CHAVEZ, the editing and audio skills of EMIL STARLIGHT of Limelight Multimedia, and ALEX F. for marketing and pod support.