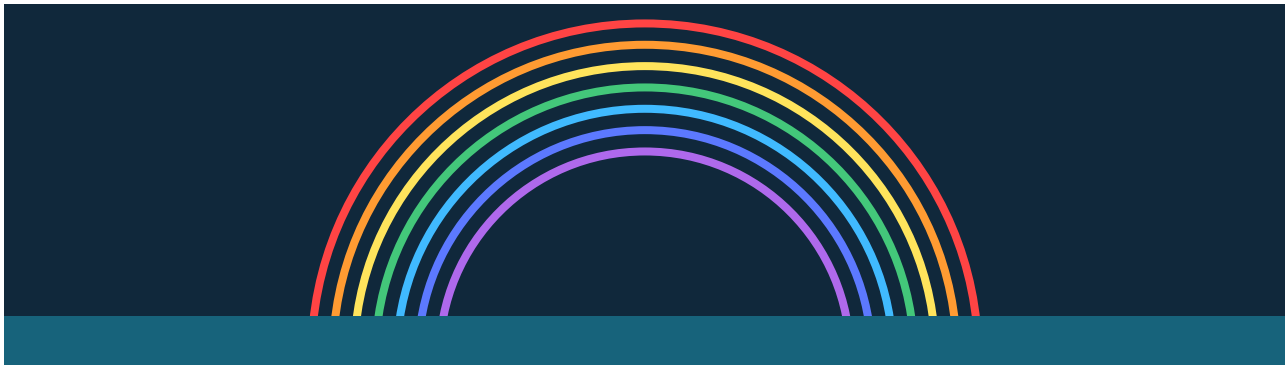
The Rainbows of Polynesia

Ocean light, tropical showers, mountain clouds, optical physics and cultural traditions



15.1 — Ocean, sun and tropical rain

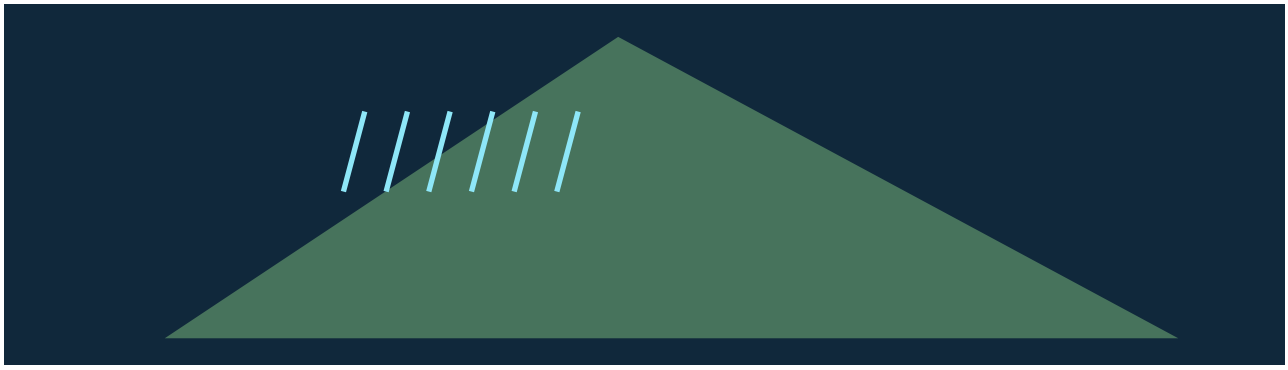
Across Polynesia, rainbows frequently appear where low-angle sunlight meets passing showers over ocean and island landscapes. The primary rainbow is produced when sunlight enters nearly spherical water droplets, refracts, reflects once inside, and refracts again as it exits. Different wavelengths leave at slightly different angles, producing a colored arc centered opposite the Sun. For an observer near sea level, the primary bow has an angular radius of approximately 42 degrees from the antisolar point. The bow is not a fixed object in the sky: each viewer receives light from a different collection of droplets.

15.2 — Trade winds and passing showers

Trade winds carry humid marine air across the tropical Pacific. As showers move through sunlit gaps in cloud cover, observers may see vivid arcs against dark rain clouds. Strong contrast helps the colors appear saturated, while a low Sun makes the bow stand higher in the sky. Near sunrise or sunset, the sunlight has traveled through more atmosphere, often weakening shorter wavelengths and making red or orange hues relatively prominent. Wind can shift the rain curtain quickly, so a bow may appear, fade, and re-form within minutes.

15.3 — Volcanic mountains and orographic rainfall

On high volcanic islands, moist air is forced upward over windward slopes. Cooling air condenses into clouds and rain, creating local showers that may coexist with sunshine along the coast or on leeward ridges. A person looking away from the Sun toward a shower can see a rainbow framed by green valleys, sea cliffs, or waterfalls. Local topography affects where droplets occur and where sunlight penetrates, but does not change the underlying refraction angles. On smaller low-lying atolls, showers above lagoons and open water create different, often unobstructed, horizons.

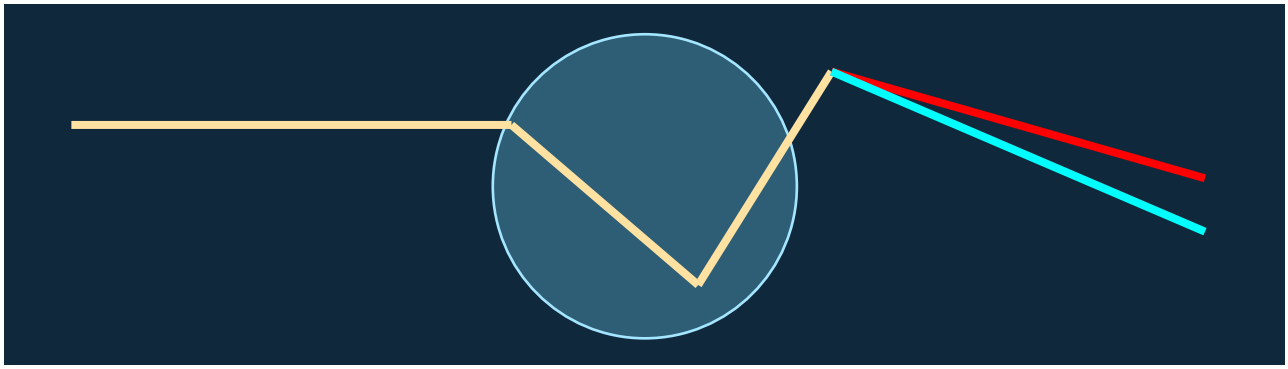


15.4 — Sea spray, waterfalls and wave breaks

A rainbow need not wait for a rainstorm. Surf striking reef edges, ocean blowholes, waterfalls, and fine mist from boat wakes can all supply droplets. A spray bow is most visible when the observer stands with the Sun behind them and the spray in front. Droplet size distribution matters: large drops often yield sharply separated colors, while very fine droplets can produce broad, pale bows. A changing spray plume can create fragments of arcs rather than a complete semicircle.

15.5 — Double rainbows and color order

When light reflects twice inside a raindrop, it can produce a secondary bow outside the primary one, at an angular radius of roughly 51–54 degrees. Its colors appear in reverse order, and it is usually fainter because additional light is lost during reflection. The region between the bows can appear darker, an effect known as Alexander's dark band. In tropical settings, dark storm clouds and bright breaks of sunlight can make this contrast especially conspicuous; the phenomenon is not unique to Polynesia.



15.6 — Fine droplets and wave optics

Some rainbows show extra narrow pink, green, or violet fringes just inside the main bow. These supernumerary arcs arise from interference between light waves following different paths through droplets. They are easiest to see when droplets have a relatively narrow size distribution. Mist or cloud droplets may instead produce a broad, nearly white fogbow. Such effects require wave optics for a full explanation; a simple ray diagram alone cannot reproduce all the observed color bands.

15.7 — Polynesian cultural traditions

Rainbows have significance in a variety of Polynesian oral traditions, but there is no single universal 'Polynesian rainbow myth.' In Hawaiian traditions, rainbows (■nuenue) appear in poetry, place-based knowledge, and stories, and can carry associations with chiefly or sacred presence in particular contexts. Meanings vary among communities, tellers, islands, and historical periods. Any specific narrative should be attributed to its own language and source rather than presented as a belief shared by all Polynesian peoples.

15.8 — Observation and local knowledge

Ocean voyaging traditions emphasize careful observation of the sky, wind, clouds, sea state, and seasonal changes. Rainbows can indicate where sunlit rain is falling, but a rainbow alone is not a reliable compass or storm forecast. A scientific field log can record the date, island, solar elevation, cloud type, wind direction, approximate droplet source, and whether the bow is primary, secondary, spray-generated, or accompanied by supernumerary fringes. Comparing repeated observations can reveal how island terrain and daily weather patterns influence visibility.

15.9 — Photographing and measuring a bow

For a practical rainbow survey, face away from the Sun and avoid looking directly at it. Photograph a bow with a wide-angle lens, keeping the horizon and recognizable landmarks in frame; record the camera's location and approximate time. Polarizing filters may strengthen or suppress parts of the bow depending on their rotation because rainbow light is partially polarized. A phone photograph can document color order and conditions, but image processing and camera exposure make it unreliable for absolute spectral intensity measurements. Spectrometers or calibrated imaging systems are needed for quantitative comparisons.

Suggested sources: NOAA National Weather Service; AMS Glossary of Meteorology; University of Hawai■i Hawaiian language and cultural resources; Bishop Museum collections.