

EXPLORATION

Volume 3, Number 2

Quarterly



◊ *We shall not cease* ◊







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ABOVE: The 1907 Rolls-Royce 40/50 hp Silver Ghost side-valve six-cylinder engine is a work of art. OVERLEAF: Detail of one of the walls at Cueva de los Manos, a UNESCO World Heritage Centre in Río Pinturas, Argentina. COVER: Late summer in the Alaska Range (63.758110, -147.934008). All images by Jonathan Hanson.

EXPLORATION

Vol. 3, No. 2 (October 2026)

Quarterly

**“WE SHALL NOT CEASE FROM
EXPLORATION**

And the end of all our exploring

Will be to arrive where we started

And know the place for the first time.” – T.S. Eliot

Welcome to Exploration Quarterly, the publication for those who do not cease to BE CURIOUS . . . to LEARN . . . to EXPLORE . . .

We define exploration in the broadest sense:

Exploration can be geographical.

Exploration can be fractal.

Exploration can be introspective.

Exploration can be expansive.

Exploration can be structured.

Exploration can be unplanned.

Exploration can happen every day.

Exploration is continuously seeking new places, new ideas, new knowledge.

Exploration is the essence of being human, what brought us from the forests into the savannahs, and beyond the horizons of Earth to the edges of the known universe.

We shall not cease from exploration.

Thank you for joining us.

Jonathan Hanson

Roseann Hanson

Founders, Curators, Editors, Designers



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The World in the Palm of Your Hand

by Roseann Hanson

Roughly five by three inches wide and an inch thick, this ochre-clay tablet is small enough to fit in a human hand yet depicts the entire known world of its authors in the ninth century BCE.

Created by Babylonians, whose kingdom thrived from 1894 to 539 BCE in the land called Mesopotamia between the Tigris and Euphrates rivers (*mesopotamia* is Greek for “between rivers” and corresponds roughly to today’s Iraq), the tablet centers on the Euphrates and includes seven cities, including Babylon, as well as seven (or possibly eight) “regions” (*nagu*) that are beyond the “bitter sea,” depicted as a wide ribbon surrounding Mesopotamia and is likely the salty Mediterranean. The minuscule cuneiform text is Akkadian, an East Semitic language that was replaced by Old Aramaic in subsequent centuries.

The tablet was excavated in the 1870s by Oxford-trained Assyrian (today he would be Iraqi) archaeologist Hormuzd Rassam at Sippar, about 60 km north of Babylon on the east bank of the Euphrates. The British Museum acquired the tablet in 1882 and the text was translated in 1889 by German Assyriologist F. E. Peiser in the journal *Zeitschrift für Assyriologie*, although experts cannot always agree on the interpretations (as one would expect in the highly competitive fields of archaeology and archaic language translations). British Museum expert Dr. Irving Finkel was one of the subsequent experts who helped navigate the interpretations and bring light to the contents of the tablet, including geographical as well as mythological information.

Continued on page 12



The Best Car in the *Aids the Great Arab Re*



By Jonathan Hanson

Images by the author and as noted

Today, Rolls-Royce is known for crafting automobiles of sumptuous elegance, but when the company earned its nickname “The best car in the world” it wasn’t because of bookended veneer on the dashboard or Wilton carpeting on the floor.

In 1907 the company—then barely three years old—introduced a new model, the 40/50. (The numeric designation, used on many British vehicles, referred to the calculated horsepower used for taxing purposes followed by the actual brake horsepower.) The centerpiece of the car was a new seven-liter, six-cylinder, side-valve engine that incorporated extremely advanced features for the time: a seven-main-bearing crankshaft with full-pressure lubrication and an enlarged center bearing to reduce vibration, two spark plugs per cylinder to ensure efficient combustion, aluminum-alloy pistons, and an alloy crankcase. (Starting, however, was still by a crank at the front of the engine; electric start would not appear on the 40/50 until 1919.)

At the time, automobiles were still considered novelties, unreliable and fragile—despite the fact that, in 1905, there were over 200 manufacturers of automobiles in England alone, mostly former bicycle makers eager to get in on the fad. Also, while Edgar Hooley had patented the “Tar Macadam” (trademarked “Tarmac”) road surfacing system in 1902, it was far from common, and most roads were rough and pitted, ideal for revealing any weakness in a complex and heavy machine cobbled together by someone who probably had more experience building 30-pound pedal-powered devices.

Rolls-Royce’s managing director, Claude Johnson, was determined to prove the 40/50 was cut from superior cloth. He pulled the 12th chassis, serial #60551, off the production line, and ordered an open four-seater body from Barker & Co. (automobile coachwork was commonly farmed out at the time, especially in England). Johnson

World revolt



“We had our evening cocktail too, reserved for the end of particularly trying days . . . It was a relic of the old war days, invented as far as I can remember at Trônes Wood by the doctor of the 20th Divisional Engineers with whom I used to serve.”

– Ralph Bagnold, *Libyan Sands*, 1935



A Cocktail for Trying Days

by Roseann Hanson

T.E. Lawrence's brilliant military strategy and success with the Great Arab Revolt in north Africa during World War I helped Britain thwart the Ottoman Empire's alliance with Germany (see page 16). That expertise was passed directly to Brigadier Ralph Alger Bagnold, OBE, FRS (1896–1990)—a desert explorer, engineer, and geologist who co-founded the north African reconnaissance and raiding unit known as the Long Range Desert Group during World War II.

In the 1920s, Bagnold corresponded with T.E. Lawrence to seek his advice on desert travel and survival. In 1932 Bagnold completed the first recorded east-to-west crossing of the formidable Libyan Desert, among many other explorations (see an excellent map at Chris Scott's Sahara-Overland.com).

As an engineer and geologist, his studies of aeolian processes contributed significantly to our understanding of wind-borne sand and the formation of dunes. After his crossing of the Libyan Desert, he returned to England and built a wind tunnel to conduct experiments. Combined with his field studies, the results lead to the 1941 book *The Physics of Blown Sand and Desert Dunes*, which saw four printings, the latest in 2005. Still the main reference in the field, it was used by NASA for studying sand dunes and the development of sand-driving mechanisms on Mars; Gale Crater's dunes were named the Bagnold Dune Field.

During his 1930s explorations, Bagnold invented the sun compass, the function of which was not affected by ferrous ore deposits or steel vehicles. Thanks to his knowledge of the physics of sand, he and his team regularly lowered pressure in their vehicle tires to increase flotation, a common four-wheel-drive strategy today.

Meanwhile Bagnold was in Cairo on June 10, 1940 when Italy declared war with Britain in alliance with Germany. Off he went to the office of General Archibald Wavell, commander-in-chief Middle East, British Army. Given his experience, Bagnold suggested he establish a mobile scouting force for desert operations against the Italian Armed Forces in Libya.



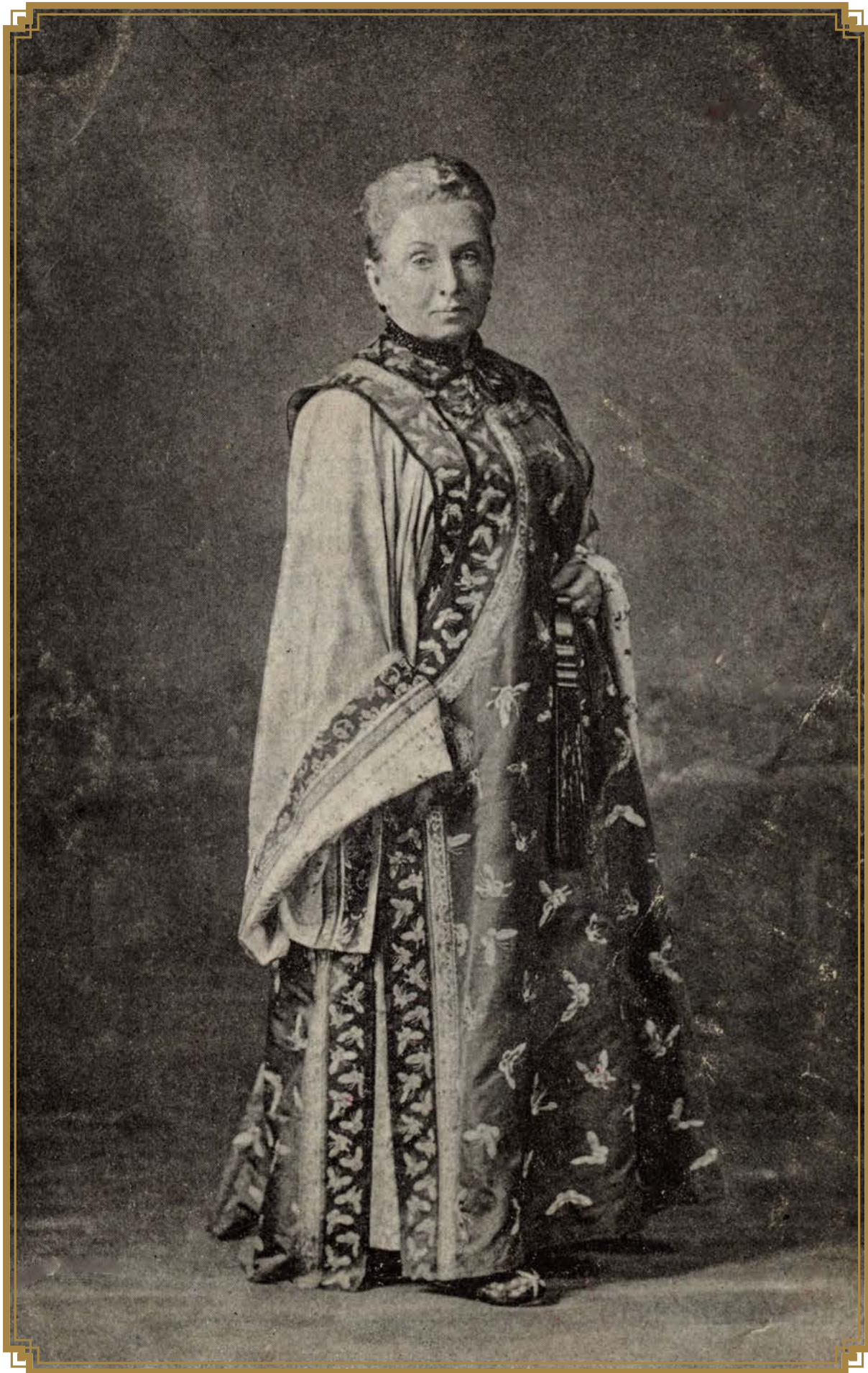
RegimentalBadges.com

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Alger Bagnold, OBE, F
28 May 1990).



RIGHT: Long
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Bagnold Dune Field,
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ert Group regimental
ion. Brigadier Ralph
FRS (3 April 1896 –





Isabella Bird

One of the most accomplished of the Victorian era, Bird was six feet tall—taller than most of the men of her time. In 1855, she traveled to China, where she experienced the pain through

Yet she explored the world, including the Himalayas, and wrote a series of articles on her travels for the *Geographical Magazine*.

Isabella Bird was the daughter of Edward Bird, the first vicar of St. Martin's Church, Tattenhoe, in Northamptonshire. However, his father, a wealthy landowner, died of labor or trade, and the family was left with a large debt, especially with the death of Edward's father until Monday morning. The family's congregation for St. Martin's Church in Birmingham. Since then, the family (under a hail of criticism) had moved to Wynton, and Isabella was then Wynton.

(This devotion to the church was considered pernicious. Edward Bird, the first vicar of St. Martin's Church, Tattenhoe, in Northamptonshire, was a pious man, and his family's plantations, and his family's driving force behind the trade. Isabella

Oddly, despite her father's death, Isabella's father was a man of intelligence and

ABELLA BIRD

solo explorer, photographer, ethnologist, nurse

by Jonathan Hanson

thing became abundantly clear as I dove deeper and deeper into the research for this story: the amount shared with you in *Exploration Quarterly* is but a damselfly resting on the surface tension of the river of Isabella Bird's astonishing life. This diminutive woman —she was four feet, eleven inches tall—grew up in Victorian England, when women either married and had children or worked in factories. In her teens she endured an operation to remove a tumor near her spine, and suffered chronic pain throughout her life.

explored remote regions ranging across five continents, often solo, riding horses, mules, camels, and yaks, with a revolver and her wits for protection. She wrote 10 popular books and dozens of travel and ethnography. And she was the first woman elected as a fellow of the Royal Geographical Society and the Royal Scottish Geographical Society.

Isabella was born in 1831. Her father, the Reverend John Bird, took the position of rector of St. Alban's Church, when she was just a year old. His adamant refusal to countenance either church services on Sundays made him unpopular—especially among farmers whose cows couldn't wait to be milked—and a hostile, declining congregation forced a move in 1842 to St. Thomas's in London. Six years later, he suffered the same fate of stones and insults from parishioners, and was uprooted again, first to Eastbourne,

then to London. She ran in the family, and was not always popular. Her mother's sisters refused to use sugar in their cooking in protest against slave labor on Caribbean plantations. And a cousin, William Wilberforce, was the driving force behind Britain's abolishment of the slave trade. (Isabella inherited this altruism.)

Despite his conservative views on religion, her father and her mother, Dora, recognized her talent and schooled her at home in Latin, French,



ABOVE: Isabella photographing in Swatow (Shantou), China, in 1895; image by Mr. McKenzie ([Library of Congress](#), public domain). LEFT: An 1899 G.P. Putnam's Sons publicity photo ([New York Public Library's Digital Library](#), public domain).

Meanwhile, Isabella, her mother, and her younger sister Henrietta moved to a house in Edinburgh—and Isabella Bird’s life of travel and adventure very nearly ended there. She convinced herself that travel was frivolous and self-indulgent—the opposite of a frugal life of devotion. She continued to write, but mostly on religious subjects. And she intensified her philanthropic works—financing Scottish farmers thrown off their leased land to move to Canada, visiting the slums in Old Edinburgh, and penning impassioned pleas on behalf of the residents. In 1866 her mother died, and Isabella and Henrietta (“Hennie”) agreed to continue to live together; neither had an interest in marriage, and Hennie, shy and retiring, was happy to assume the role of homemaker.

For several years Isabella held her drive to travel in check. But in 1869, at age 35, she found herself in its grip once more. Trying to rationalize her passion with perceived duty, she considered a pilgrimage to the Holy Land, but still guilt held her back for years. She contacted John Murray, who—naturally—urged her to get on a ship and go. As if on cue, her old aches and pains returned. Doctors tried several outlandish treatments, but in the end issued the expected prescription. And, finally, Hennie pressed her to leave. The sisters rented a cottage in Tobermory on the island of Mull, where Hennie could stay, and Isabella bought a ticket for Australia and New Zealand.

A Cliff’s Notes version of the next year would go something like this: She found Melbourne strangely familiar in its Englishness, but stiflingly hot, so she escaped up country to a sheep station. She wrote Hennie—in the first of scores of letters that would form the basis for most of her travel books—“I have seldom enjoyed an evening more than one I spent with a large shearing party at one of the loveliest and wildest of the hill stations, round a great bivouac fire, where huge beefsteaks were broiled over the embers, and pannikins of strong tea circulated, and stories were told, and songs sung . . .” Back in on the coast she boarded a steamer for Auckland, which turned out to be as stifling as Melbourne—and, alarmingly, no relief from her symptoms. Trunks packed again, she snagged passage for America on a leaky paddle steamer—which promptly ran into a massive hurricane and sank two feet on her waterline by the time the storm abated. Isabella wore her waterproof

cape against the drips from her cabin roof, and swatted cockroaches skittering about under her mattress. This kind of strife was pure grist for her mill. Her symptoms disappeared, and the letters she wrote Hennie described her exhilaration at the tempest.

A medical emergency involving a fellow passenger’s son necessitated a detour to the Sandwich Islands (Hawaii), and there Isabella discovered paradise. She found women riding horses astride, rather than sidesaddle as was considered proper in England, and adopted the posture for herself, scandalizing many future observers (she also found it reduced her back trouble). She traveled to the Big Island and climbed

Kilauea to the active volcanic lake of *Halema`uma`u*, marveling at its fountains of molten lava. She

undertook a strenuous multi-day horseback journey, solo. Her letters to Hennie during her months-long stay were now 20 and 30 pages long. She wrote, “I am doing what a woman can hardly ever do—leading a life fit to recruit a man.”

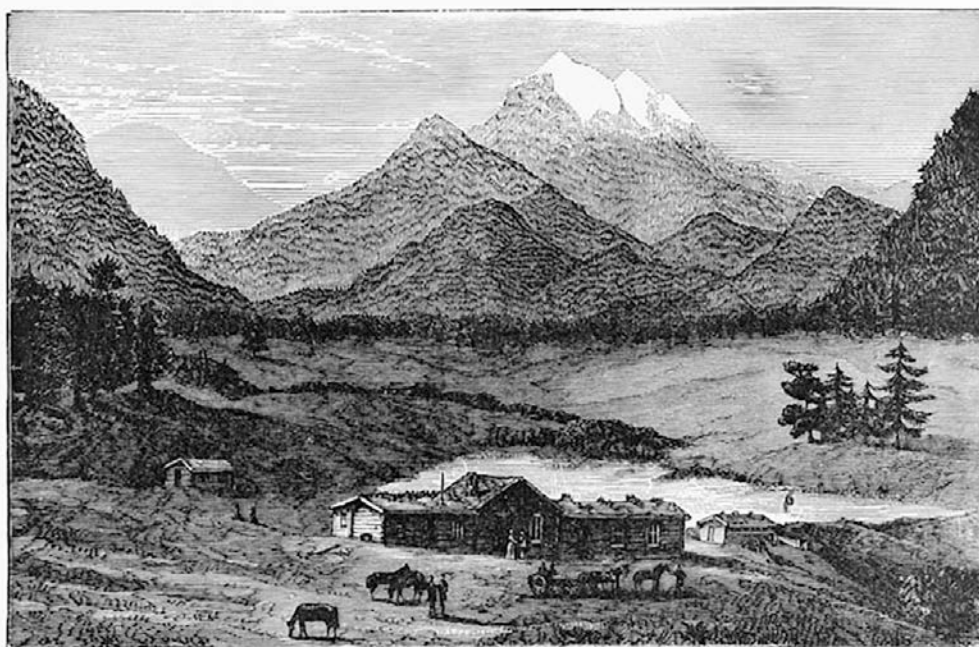
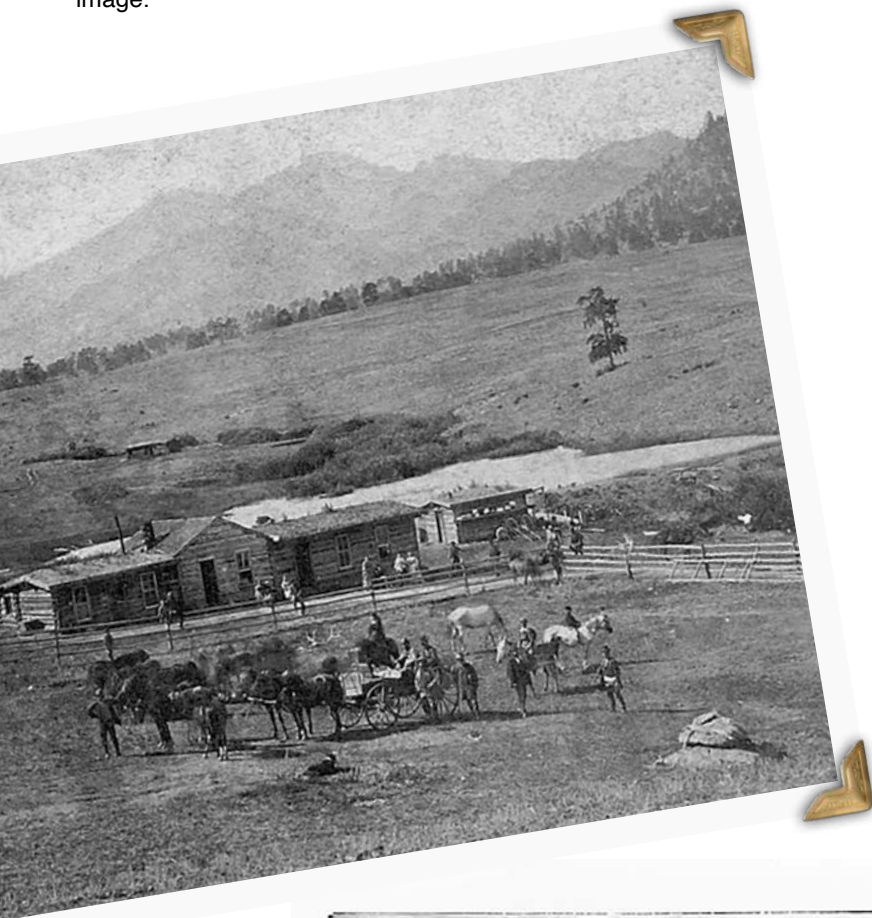
She continued doing exactly that after sailing on to San Francisco and boarding a train to Colorado. When the train reached

Greeley, Colorado, she spent a night in a flea-infested boarding house, and was not impressed with the frontier boom town. “These new settlements are utterly revolting, entirely utilitarian, given up to talk of dollars as well as to making them, with coarse speech, coarse food, coarse everything.”

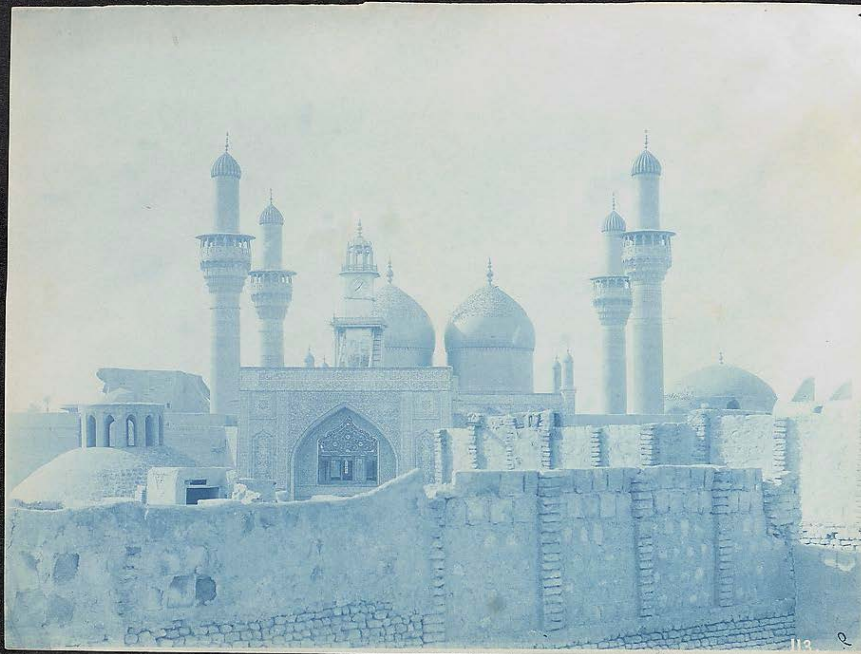
Nevertheless, she was determined to reach Estes Park, which she’d been told was renowned for its beauty. The two young guides she hired to take her there warned her about a “notorious ruffian” named Rocky Mountain Jim Nugent who lived on the route—who indeed confronted their party along the way, wearing moccasins and a grimy hunting outfit, knife in his belt and a revolver in a coat pocket. His one eye (the other lost in a fight with a grizzly bear) appraised Isabella—then he bowed and, in a gentle Irish accent, offered her water. While her guides looked on in astonishment, the “ruffian” and the cultured Englishwoman engaged in polite conversation, at the end of which he said, “You are not an American. I know from your voice you



LEFT: Frontispiece illustration of Isabella on her horse, from the second edition of *A Lady's Life in the Rocky Mountains* (1879); public domain, HathiTrust Digital Library. RIGHT: 1873 studio portrait of Isabella taken in San Francisco. BELOW: stereo-view of the Estes Park Griff Evans ranch where Isabella stayed; a series of regional images was mass produced for tourists beginning in the 1870s (W.G. Chamberlain and Estes Park Archives). The illustration from *A Lady's Life in the Rocky Mountains* appears to have been based on this image.



MY HOME IN THE ROCKY MOUNTAINS.



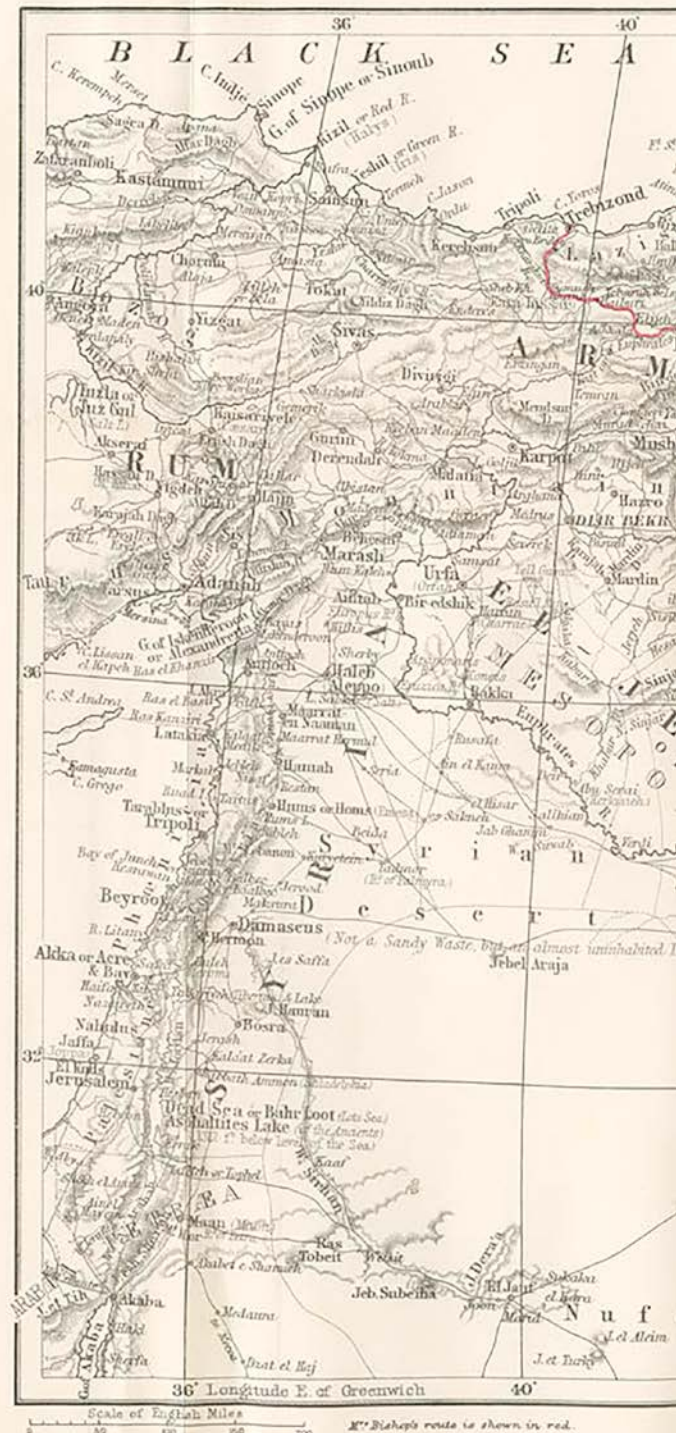
Shrines of Kazimain, near Baghdad, 1890, from *Journeys in Persia and Kurdistan* (1891) Volume 1, page 23.



Description of the school and pupils at Julfa, 1890, from *Journeys in Persia and Kurdistan* (1891) Volume 2, pages 250-1.

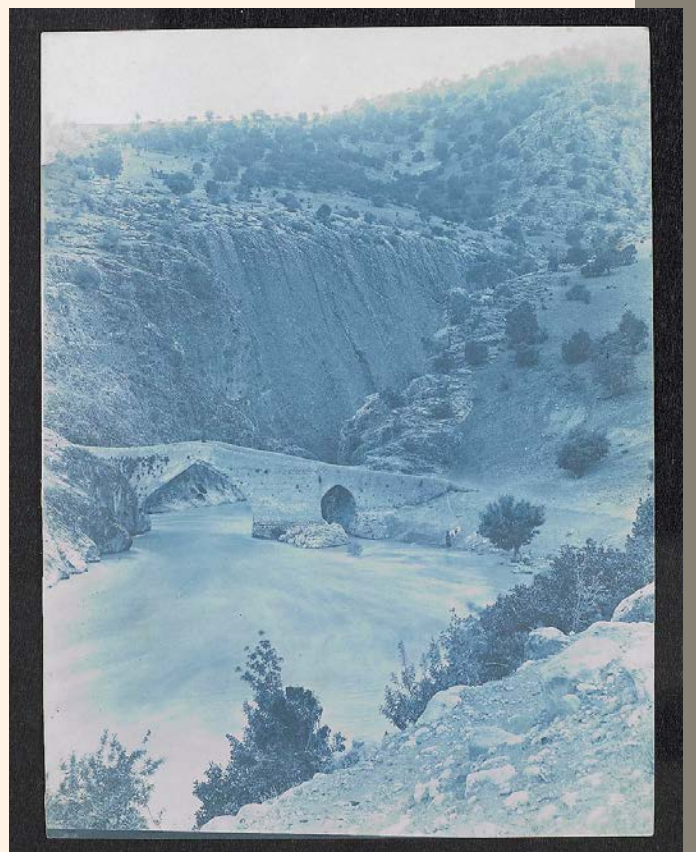
Images by Isabella Bird,
courtesy the [National Library of Scotland](#)
(follow link to peruse
more images). Map by
John Murray, London,
showing Isabella's Persia
journeys.

Stone lion and
guide, 1890.
Annotated on
the reverse of
photograph, "Cure
for cowardice.
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Far East Man on
horseback & tomb,"
from *Journeys
in Persia and
Kurdistan* (1891)
Volume 2, page 8.





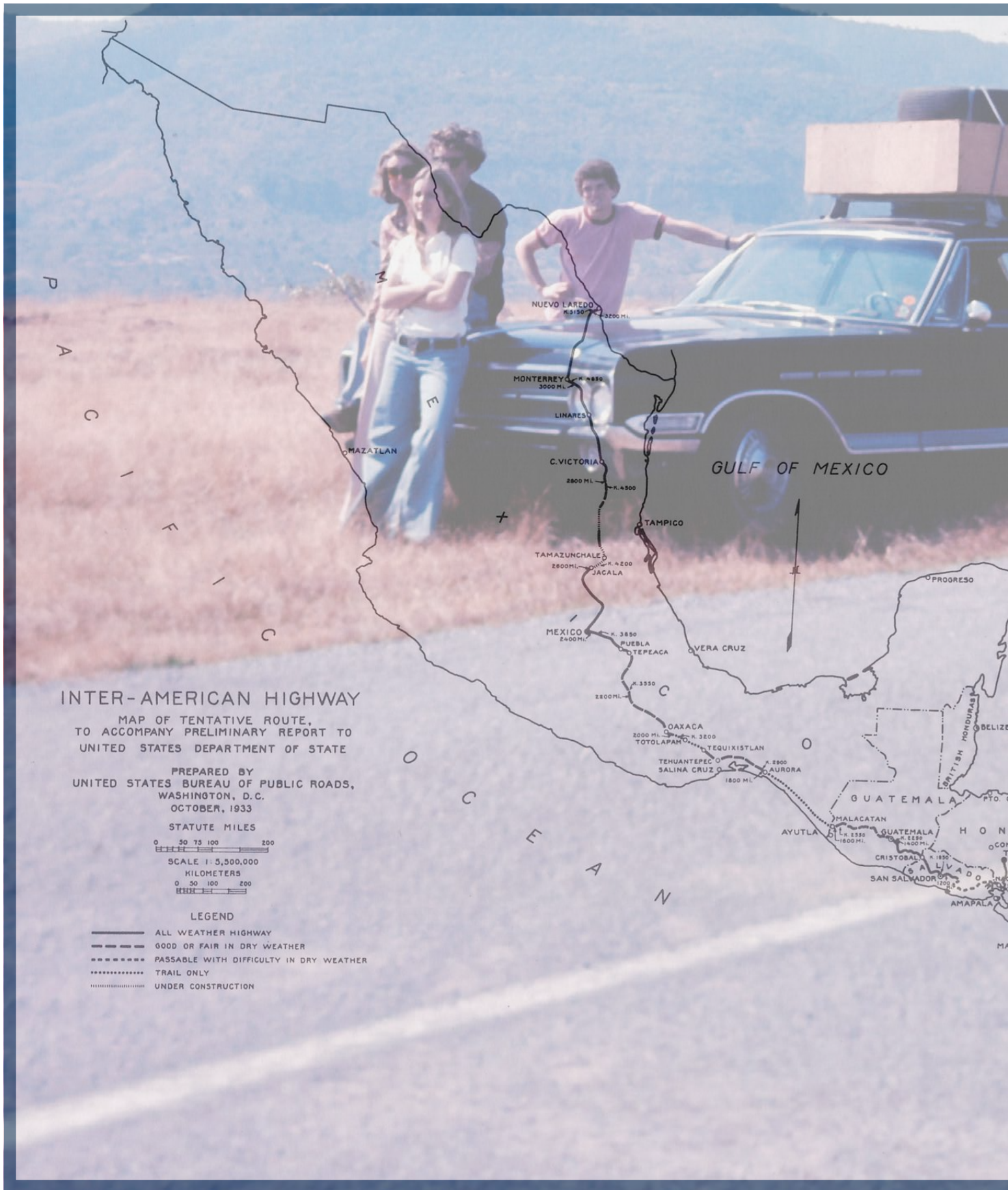
Ali Jan (central figure) with his brothers, 1890, from *Journeys in Persia and Kurdistan* (1891) Volume 1, page 362.



The Karun River at Dupulan, 1890. Annotated on the reverse of photograph "Bridge over Karun at Dupulan —A Bridge & a Gorge Bend of a River Process" from *Journeys in Persia and Kurdistan* (1891) Volume 1, page 351.



Camp site opposite the village of Shamsabad with the mountain Jehanbin in the background, 1890. from *Journeys in Persia and Kurdistan* (1891) Volume 1, page 312.



Overland to Panama, 1974

by Jack Walter

Images courtesy the Walter family

Normally the thought of going to your father's 30th high school reunion wouldn't come in on top of a son's list of Things I Want To Do Together.

But my father, John Francis (Jack) Walter, although born in New Jersey, grew up in the Panama Canal Zone and went to Balboa High School in Panama City, where he graduated in 1944. So when he suggested in 1974 that our family drive from Atlanta, Georgia, to Central America . . . well, that was different.

I was lucky enough to have adventurous parents who liked to travel (and drag their kids along) to some pretty neat places. After high school Dad joined the U.S. Navy with the ambition to become a fighter pilot—specifically the F4-U Corsair. Luckily for me the war ended before he finished training, or this story may have never happened. He met my mother, Anna Mia Gage, in 1945; he was at Georgia Tech; she was at Agnes Scott College. After finishing his masters in electrical engineering he went to work for RCA, did a year at Studebaker, and then came to Lockheed Georgia in 1955 to establish their Numerical Control Machine Tool Shop. My two sisters and I grew up in Atlanta, and we had many occasions to travel all over the U.S. in various Ford Country Squire station wagons.





In 1974 the Walter family decided to drive from their home in Atlanta, Georgia, to Jack Sr.'s high school reunion in Panama City, covering 5,300 miles in a little more than four weeks—a significant stretch of the Pan American Highway. Their steed was an enormous decade-old Buick Electra 225, which required significant bush mechanic skills to nurse it to Panama, with a surprising swan song.



Now Dad had a much more ambitious plan for us—he wanted us to see Panama and the canal, where he spent 12 years of his life.

In 1974 the Pan-American Highway was still mostly a concept south of the U.S. border. Dad's plan was to buy a car big enough to carry us all through Central America, but cheap enough to walk away from and fly home at the end of the trip (it was always planned to be a one-way drive). His choice for our adventure was a pretty unlikely steed: a huge black 1965 Buick 225 Electra four door sedan equipped with lots of chrome. The deuce and a quarter, as they were called, cost a princely \$600—our departure date was the second week of January.

The plan was for Dad and me to drive the first 1,800 miles to Mexico City, where we would pick up Mom and little sister Lisa as they flew in from Atlanta. From there the trip would cover another 2,600 miles through southern Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama. We only had four days to get from from Atlanta to Mexico City to meet the girls, so we decided to recruit another driver to help and convinced Ken, the son of some family friends, to join us.

Our trip preparations consisted of bolting a large wooden box to a gutter-mount roof rack to hold an extra spare tire and three 5-gallon cans—two for gasoline and one for water. We packed a rudimentary tool kit with some wrenches

and screwdrivers, a box of food, and our clothes, and considered ourselves ready to go. Notice the complete lack of any of the “required” expedition gear we are so fond of now.

We left Atlanta on Tuesday morning, with the requirement that we be at Mexico City airport by 10:00 a.m. Saturday to pick up Mom and Lisa. In 1974, I-85 ended at Newnan and didn't resume until you got almost to Montgomery, Alabama. Everything went pretty smoothly for the first couple of hundred miles. Then, somewhere in southern Mississippi, the top radiator hose exploded; a small portent of what would become a recurring theme. As we waited for the mighty Buick to cool off enough to remove the radiator cap I took the water can to the nearest house to fill it up. It was an old sharecropper's cabin with a hand pump in the front yard. The old Black man on the front porch graciously told me to help myself and I filled up the can and lugged it back to the steaming Buick. We wrapped a rag and some duct tape around the hose to get us to the next town, where we got a new hose—but the 225 never really ran right from then on. This little problem disrupted our plans to take a leisurely drive through southern Texas on our way to the border.

As we crossed Texas via Houston and San Antonio on day two (with a quick stop to visit the Alamo) it was obvious the Buick wasn't happy. We made it to Laredo that evening, where under-hood exploration revealed a water pump way past its prime. The first thing next morning we found an



Color visible



ABOVE: Die Temperamenten Rose by Johann Wolfgang von Goethe, Friedrich Schiller, 1798-99. ([Public domain, via Picryl](#)).

RIGHT: Goethe's color wheel, as reproduced in his 1810 *Theory of Colours* (*Zur Farbenlehre*), [Universität Mannheim](#).



Science 101: Translating the light into watercolor

without creating a muddy mess

by Roseann Hanson

As a reader of this magazine dedicated to exploration—adventure, cartography, virtualizing, tools, and field arts—you would be classified as “Choleric” according to poet, artist, and politician Johann Wolfgang von Goethe (1749–1832) and philosopher Friedrich Schiller (1759–1805) in their *Temperamenten-Rose*, or Rose of Temperaments. (Choleric at the time being defined as having an excess of bile—*choler*—believed to cause a hot-tempered or forceful personality, presumably necessary to sally forth into the unknown as an adventurer.)

Goethe and Schiller’s *Temperamenten* (1789-1799) was a circular color diagram that matched 12 colors to human personality traits, occupations, and behaviors. The compatriots explored how “color psychology” and emotion connected with the visible color spectrum, which was discovered by Sir Isaac Newton in 1666.

“Rather than just measuring light scientifically, the rose mapped how people project human feelings, symbolic meanings, and character types onto different hues.” (*Wikipedia*)

To wit:

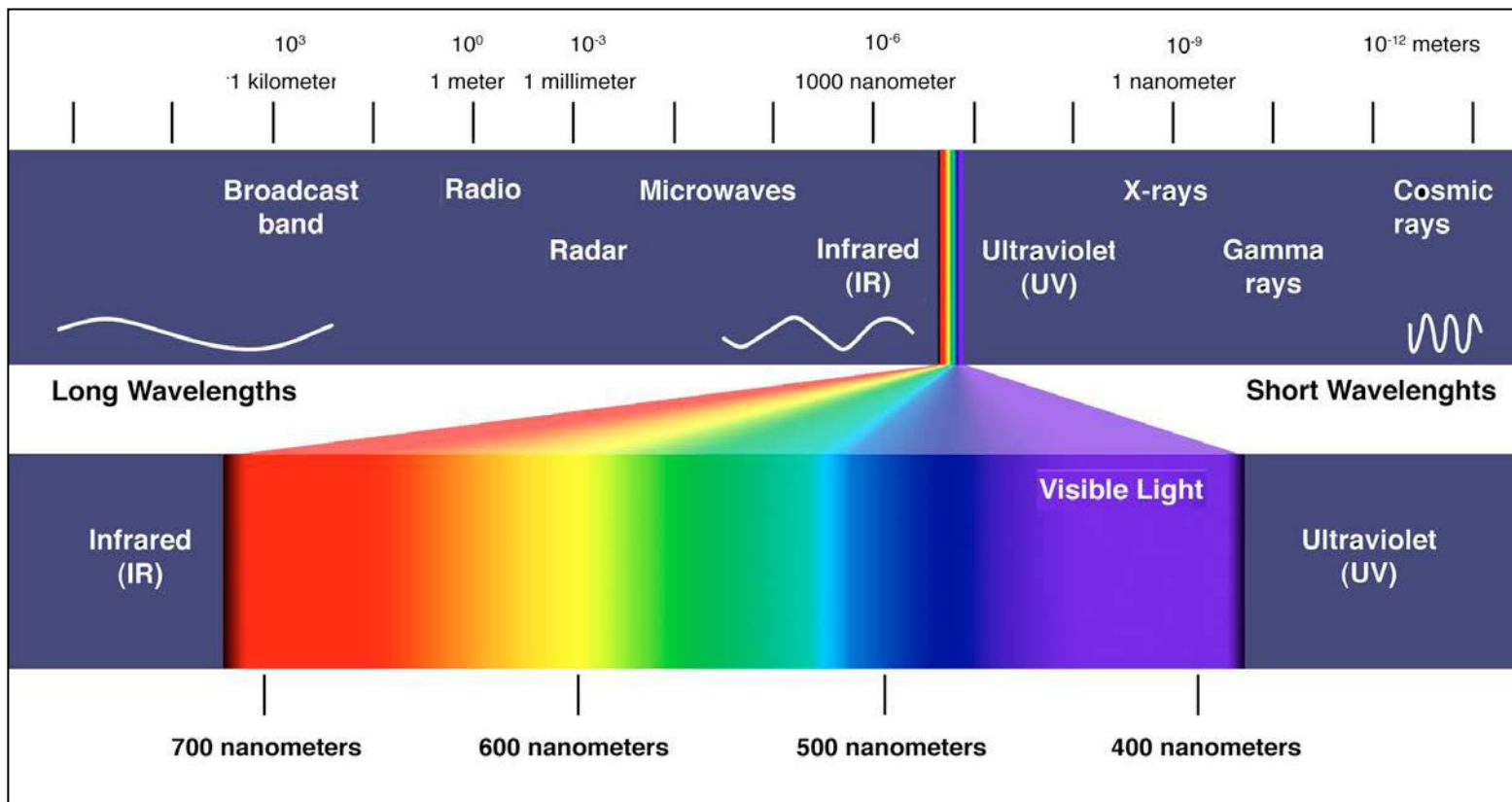
Choleric (Red, Orange, Yellow): Linked to active, energetic, and forceful traits; associated with tyrants, heroes, and adventurers.

Sanguine (Yellow, Green, Cyan): Linked to light, playful, and warm traits; associated with hedonists, lovers, and poets.

Phlegmatic (Cyan, Blue, Violet): Linked to calm, steady, and intellectual traits; associated with public speakers, historians, and teachers.

Melancholic (Violet, Magenta, Red): Linked to deep, serious, and imaginative traits; associated with philosophers, pedants, and rulers.

As amusing as these profiles might be—an archaic color-centric version of modern Myers-Briggs profiling—what is more applicable and interesting to the adventurer-field artist is the underlying science: the color spectrum as described by Newton, who demonstrated by use of prisms that visible light was composed of red, orange, yellow, green, blue, indigo, and violet. Goethe understood this, but he concerned his views not so much with scientific treatment of the color spectrum as with how color is *perceived*. And, he was spot-on regarding perception, although it has more to do with human eye physiology than with the philosophic tradition of personality traits.



Electromagnetic radiation visible to humans: red, orange, yellow, green, blue, indigo, and violet. Non-visible radiation includes long waves such as radio, radar, microwaves, and infrared, and short waves such as ultraviolet, X, gamma, and cosmic rays.

Goethe wrote:

“When the eye sees a color, it is immediately excited and it is its nature, spontaneously and of necessity, at once to produce another, which with the original color, comprehends the whole chromatic scale.”

What Goethe sensed was actual quantifiable color science. The human eye is an astonishing organ, especially considering its size. Each of our eyeballs contains in its retina some 120 million photoreceptor cells called rods, which excel at gathering information in low light but do not perceive color. Enter the cones, with six million photoreceptor cells per eyeball. These cells, also located in the retina, are the *colormeisters*. The cones detect three color-families of light (a trait called [trichromacy](#), common among primates and marsupials), based on wavelength between peaks and measured in nanometers:

L-cones (long wavelength; 560nm–580nm): Red.

M-cones (medium wavelength; 530nm–545nm): Green.

S-cones (short wavelength; 420nm–440nm): Blue.

The photoreceptor cells in our eyes are activated by light. It’s the brain that creates the kaleidoscope of colors from the red, green, and blue (RGB) receptors that constantly process the visible spectrum. Objects don’t really “have” a color—rather, they give off light that *appears* to be a color (this was explained well by high school physics teacher and author of the [Physics Hypertextbook](#) Glenn Elert).

Another way to think of this color-mixing-in-light is that the brain is the painter, using red, green, and blue.

But wait! you exclaim. *What about yellow? I thought red, blue, and yellow are the primaries that make all the other colors, like green.* Ah yes, that is very confusing. Rest assured there is a completely different system of colors for the printed—or painted—spectrum, which we will explore shortly, and yes, it includes yellow.

Here’s how color-mixing-in-light works: when only green cones are activated by green subjects, we see green. Likewise red. When you perceive a yellow subject, what is happening is that both red and green cones are stimulated equally, producing yellow in your brain. This is hard to grasp for those of us taught that yellow is a “primary” color—but bear with me. This is color mixing with light,

not on paper with pigments. (Note the graphic at left: you can see where at the intersection of green and red, a yellow appears.)

In color-mixing-in-light, when you “mix” all colors you get white. This is called “additive.” This is what our computers and phones do: the screens emit light from the three colors of diodes—red, green, and blue; images captured on your device are classified as “RGB” if you look at the metadata (the information stored on your device that describes each image, including date, time, place, exposure, F-stop, and so on). In additive mixing, when two colors are combined, the new color is brighter, thus closer to white.

In color-mixing-in-pigment, when you mix all colors you get black. This is called “subtractive” because mixing two colors makes the new color darker, or closer to black. This is because pigments on paper are *reflecting* light, not *emitting* light. With no pigments on a page, the paper is white. If you mix red pigment and yellow pigment, as an example, the result reflects a narrower range of wavelengths of light (orange)—the overlapping wavelengths that they are able to reflect back to the human eye. [Illustration at right.] It is an interesting side note that Aristotle developed the first known theory of color, suggesting that all colors came from white and black (lightness and darkness).

The two processes—mixing-in-light and mixing-in-pigment—result in completely different outputs: red and green diodes in your device mix to make yellow because of the way your brain processes color-input. In pigment-mixing, red and green are complementary (they live opposite one another on a color wheel, see illustration at right and the color wheels on page 70) and, if mixed, produce dull olive or gray. In pigment-painting, you cannot *make* (i.e. “mix”) yellow. It is a primary color in the pigment-color system. As are cyan and magenta (neither of which you can mix).

And now we get to the crux, which is . . .

Blue-Red-Yellow Are Not True Primary Colors (but as descriptors they are useful)

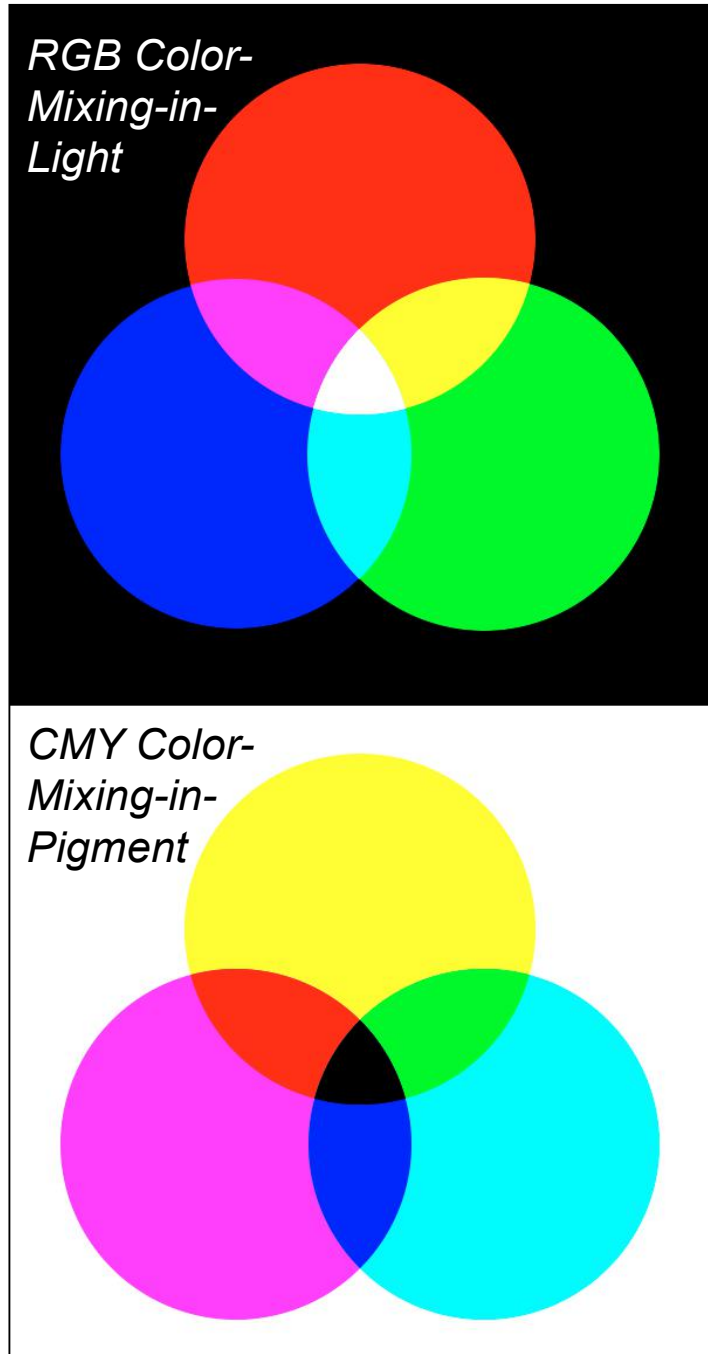
Most of us were taught in primary school that “blue, red, and yellow” are the primary colors.

But alas, this is, shall we say, overly simplified.

If you have ever taken something to a professional printer for output on paper, they will ask you to make sure the image is formatted not for RGB but for CMYK. This

*“Colour are
light’s suffering and joy.”*

– Johann Wolfgang von
Goethe



Images courtesy [Dr. Christopher S. Baird](#), West Texas A&M University, “Science Questions with Surprising Answers.”



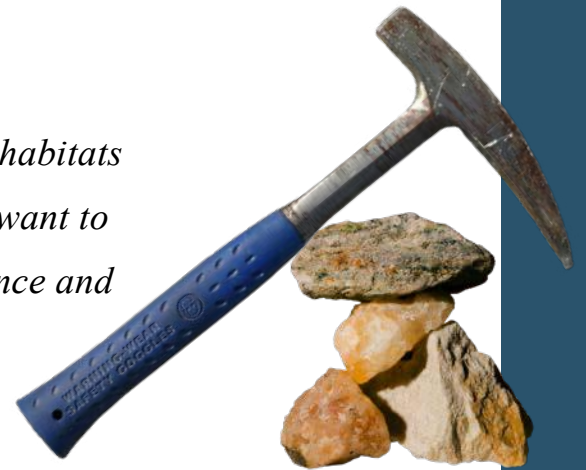
Beverly participating in a barrier island ecology study off Charleston, S.C. with the [National Oceanic and Atmospheric Administration's Teacher at Sea program](#). She first participated in Teachers at Sea onboard the FSV Henry B Bigelow off the northeast coast of North America.

Beverly Owens

Inspiring the next generation through science and art

EXPLORER
ARTIST
TEACHER

“From dinosaur digs in Wyoming, to exploring deep-sea habitats at the bottom of the ocean, exploring science is where I want to be,” said artist and teacher Beverly Owens. “I love science and I enjoy sharing it with my students.”



by Roseann Hanson

In the past 23 years, North Carolina-born teacher Beverly Owens has studied sub-seafloor sedimentology in Hawaii, ancestral Puebloan culture in Colorado, tropical ecology in Belize, archaeology in Montana, space physics and instrumentation with NASA’s MAVEN mission, engineering at the U.S. Naval Academy, indigenous peoples of North Carolina as a UNC World View Global Fellow, and Information Communication Technology with Fulbright Japan. She conducted cultural field studies in Peru as an National Education Association Foundation Global Learning Fellow, and, as a Kenan Fellow, completed an internship with American Zinc Products—the only facility in the world that produces high-grade zinc made from recycled sources—to learn about sustainability and the application of zinc products.

But that’s not all—she also participated in several at-sea research expeditions, including studying deep-sea coral habitats in the Atlantic Ocean on the *R/V Ronald H Brown*; groundtruthing deepwater canyons off North America’s northeastern coast onboard the *FSV Henry B Bigelow*; and serving as Science Communication Fellow on *Titanic*-discoverer Dr. Robert Ballard’s *E/V Nautilus*, exploring brine pools in the Gulf of Mexico.

She currently teaches science to middle schoolers at Cleveland County Schools in North Carolina. Beverly’s early education includes an associate’s degree in Art Education and History from Cleveland Community College, and bachelor’s and master’s degrees from Gardner-Webb University. She also recently completed a Natural Science Illustration certificate from the Rhode Island School of Design, in addition to certificates from the National Board for Professional Teaching Standards (an NBCT-certified teacher has earned the highest professional certification available in K–12 education by meeting rigorous national standards for teaching excellence), the North Carolina Office of Environmental Education, MakerBot Curriculum Creator, and National Geographic Educator.

Significant distinctions include the North Carolina Science Teachers Association Outstanding Science Teacher Award as well as Outstanding K–8 Educator Award, the North Carolina Outstanding Earth Science Teacher Award, and the Burroughs Wellcome Fund Career Award for Science and Mathematics Teachers. In addition to all this, she is a dedicated wife and mother of 10-year-old daughter, Emma, with whom she loves to sketch in their nature journals.

EXPLORER'S



S GIFT GUIDE

Illustration by Roseann Hanson; images courtesy Unsplash (Adakash Dhage; Vito Natale; and Katelyn Perry) and Adobe Stock.



By Jonathan and Roseann Hanson



PNWBushcraft Rugged Waxed Canvas Foraging Pouch – \$49

When we head out on explorations with our sketching kit and journals, we have our favorite field bags or backpacks, carefully packed with all we will need. But then, two hours later, you find a treasure trove of lovely agates or a stash of special seashells or a bird nest blown onto the trail in a storm. There is no room in your pack. What to do?

If you have this ingenious folding waxed canvas foraging bag attached to your belt, you simply unfurl the generous 9 x 8.75-inch pouch and load it up. Amazingly, the pocket folded up flat is only 3 x 3.5 inches, with a 2-inch belt slider on the back.

The [pouch](#)—available in eight color combinations—is heavy-duty 10.1-ounce waxed canvas with reinforced seams, and there are two strong rivets at the belt attachment point. Go ahead and load up those agates!

What more could you want? Well, PNWBushcraft is a family-owned business that makes all its clever products in Washington state, by hand. And all of their products come with a lifetime guarantee. That’s a win for us all.

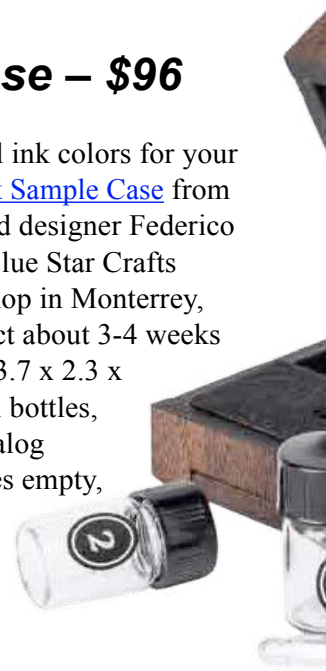
If you would like an even larger pouch, there is the Deep Waxed Cotton Foraging Pouch for \$6 more.



Blue Star Crafts Ink Case – \$96

What better way to keep a stash of special ink colors for your Lumos pen than this lovely handmade [Ink Sample Case](#) from Blue Star Crafts. Founded by architect and designer Federico Alvarado and designer Daniela Ramón, Blue Star Crafts create all of their products at their workshop in Monterrey, México. Most are made to order, so expect about 3–4 weeks for processing. Crafted of hardwood, the 3.7 x 2.3 x 1.06-inch container houses five 2ml mini bottles, one mini glass dropper, and two extra catalog sheets for labeling. The standard set comes empty, but you can also order a set pre-filled with Blue Star Craft’s Monarca Ink (with

delightful names like Tierra Colorada, Cielo Cruel, Nopal, and Rey Jaguar.



Tom's Studio Lumos Pro Refillable Pen \$79–\$126

Many of you know that I hate throw-away plastic pens in the art world. Collectively we must go through millions if not billions of them in a year worldwide. All chucked into the landfills, to break down into incredibly harmful microplastics that seep into our water supplies and food.

I love fountain pens, but they are fussy and generally you need an additional pen for each type of nib you would like to use. Enter Tom's Studio and the ingenious modern take on refillable fountain pens. Tom Gyr, a British product designer and blacksmith, began producing pens for his calligrapher wife Gemma in 2016. What began as a few dip pens had grown into an impressive offering of re-imagined writing instruments, all made in their workshop in Frome, Somerset.

The most versatile and useful for field artists is the [Lumos](#). An anodized aluminum cylinder, the Lumos can be fitted with 11 different tips (fineliners in 0.1, 0.2, 0.3, 0.5, 0.8, and 1.0; felt-tips in chisel, bullet, and brush; and writing in 0.3 and 0.5. The Lumos Pro comes in a single-tip version with one ink reservoir, or a two-tip version with two ink reservoirs so you can have two different tips and ink

colors in one pen. There are also brass, stainless steel, and titanium models (as well as a Mini), and most can be engraved.

To swap inks and / or nibs, simply rinse the nib and reservoir under warm running water, dry thoroughly, and refill with new ink. Or, you can swap out the tip and reservoir entirely and store the old ones in a ziplock bag or container. Spares are easily ordered.

The Lumos is compatible with dye-based inks that do not contain particles (such as shimmer inks) or binders (such as acrylic or shellac); a few pigment inks can be used, including Tom's No.60 Pigment Black, Sailor Kiwa-guro, and Platinum Carbon.

If you are in the United States and are concerned about tariffs and delays, Tom's Studio ships to the U.S. with all duties and taxes already paid (by them—a noble gesture and worth supporting.)

