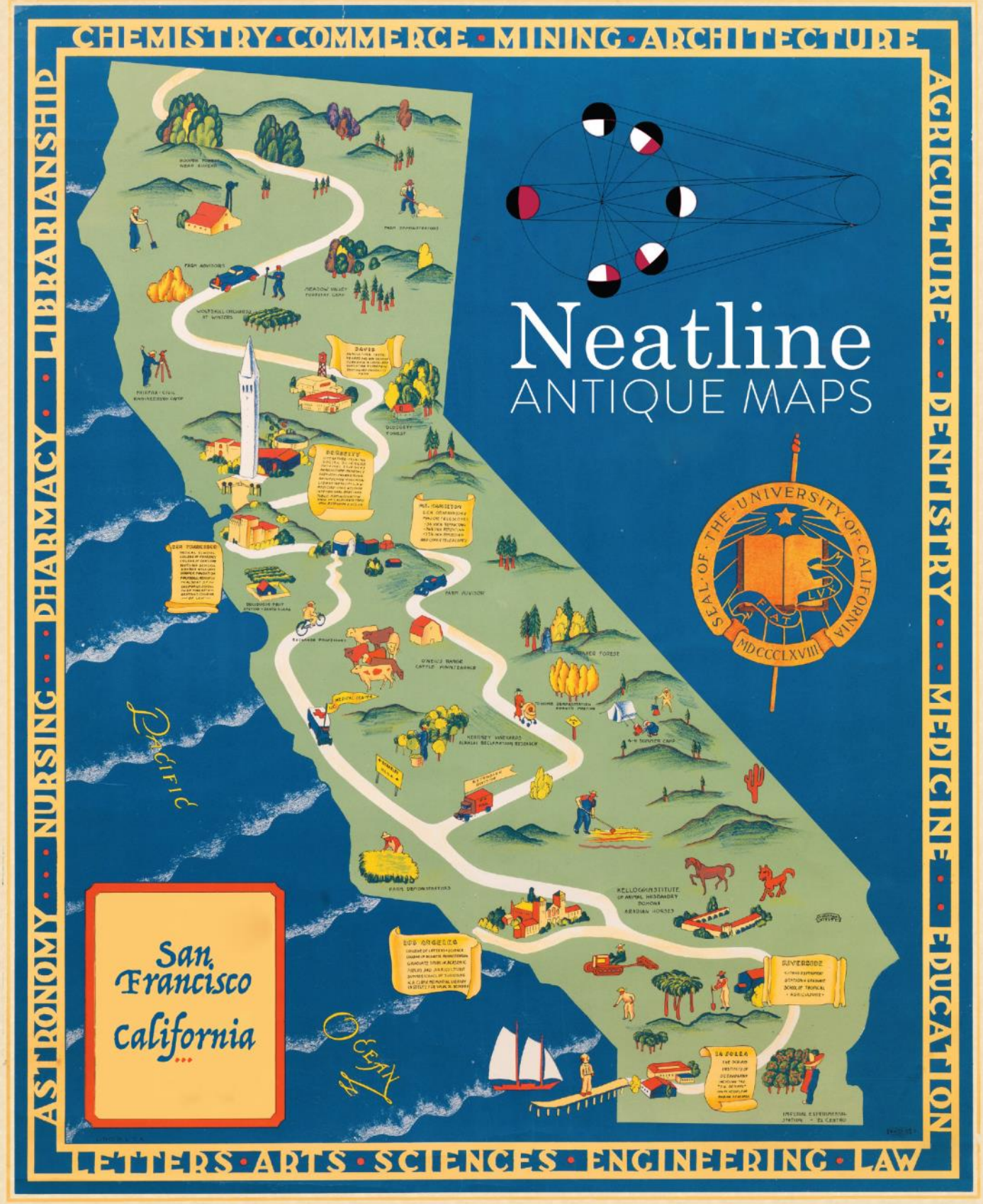
Calafia

The Journal of the California Map Society

September 2018

Grand Canyon (Detail), Bradford Washburn, Cartographer, National Geographic, 1978 (p. 9)



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THE JOURNAL OF THE CALIFORNIA MAP SOCIETY
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Calafia : The Journal of the California Map Society
Juliet Rothman, Editor
Fred DeJarlais, Publisher
The journal is published bi-annually by the Society.

Fall meeting, November 3, 2018

Los Angeles Maritime Museum, San Pedro, CA

33°44'19"N, 118°16'44"W or ///helper.minding.stuff (*)

600 Sampson Way, San Pedro, CA 90731

Southern California Meeting — Our 84th Regional Meeting

Saturday, November 3, 2018, 9:30 am to 4:30 pm

On Saturday, November 3rd, we will gather at the Los Angeles Maritime Museum, in San Pedro's historic Municipal Ferry Terminal for our annual Southern California meeting.

We have five confirmed speakers, and we are working on a few additional surprises.

Long-time CMS member Bill Warren will use 100-year-old maps to argue that the city of Los Angeles long lacked access to the ocean, which delayed its growth as a center of commerce. He will discuss the political battles of solving the harbor question, and he will clarify who actually benefited. Spoiler alert: it wasn't the public.

Turning to the present, Daniel Elroi, President and CEO of North-South GIS, will discuss how GIS technologies are used to manage logistics in ports. North-South developed the GIS systems used at the Ports of LA and Long Beach and many other major West Coast ports. When we contacted Daniel, we did not know that he has a long-term connection to CMS, and attributes his long and happy marriage to his participation in our Society.

Artist and CSU-Long Beach art professor Fran Siegel creates monumental 'collage drawings,' often using maps and other depictions of landscapes as jumping-off points in her creative process. Often, the maps she uses are clearly identifiable in her finished work. She will describe how she considers mapping as a form of visual anthropology, using examples from

(*) www.what3words.com *See What3words Remaps the World*, page 19

her own work. Fran has exhibited internationally after receiving her MFA from Yale.

Caleb 'Tuck' Finch, a leading Alzheimer's Disease researcher, will discuss his latest work connecting air quality to the aging process. His newest book, *The Role of Global Air Pollution in Aging and Disease: Reading Smoke Signals*, relies heavily on environmental research that depends on spatial analysis. Caleb is the University of Southern California's ARCO/William F. Kieschnick Chair in the Neurobiology of Aging, and is credited as being one of the top 1% cited scientists in the world.

Our old friend Julie Sweetkind-Singer will share the story of World War II maps created by the Office of Strategic Services. Thousands of maps of many different types were produced by the OSS in support of the war effort.

We hope you will join us in November at America's largest container port—a true engine of the global economy.

Jon Jablonski, SoCal VP

Driving Directions from the 110 South Freeway: Take the Harbor Boulevard exit. At the bottom of the ramp, bear right onto Harbor Blvd, and take a right onto 5th street. At the next stop sign, make a left onto Palos Verdes Street. Take the next left onto 6th Street. Continue along 6th, crossing Harbor Boulevard, and make a right turn directly in front of the museum.

There is a free parking lot next to the Museum, on the former site of Acapulco Restaurant. There is also free street parking available.

Directions coming from the West: Bear east on 22nd Street and take a left onto Miner Street. Follow signs to Harbor Boulevard. Take a right at the intersection of Harbor and 6th Streets and follow the parking directions above.

President's Letter

September 2018

Susan Caughey

I recently visited the Los Angeles Maritime Museum in San Pedro, where we will have the fall Southern California meeting. It's located on the Main Ship Channel of the Los Angeles harbor. I felt like I was walking in the footsteps of Juan Rodriguez Cabrillo, whose two ships sailed into San Pedro Bay on October 8, 1542. He named it Baya de Los Fumos, the Bay of Smokes. Some argue that he was actually in Santa Monica Bay, but most believe it was San Pedro (locally pronounced "San Pea-dro").

The museum is housed in the former Municipal Ferry Terminal building. It was designed in the Streamline Moderne style and was built in 1941 at Berth 84 by the Works Project Administration (WPA).

The ferry connected the mainland to Terminal Island, which was important for naval operations and ship building during World War II. It ceased operations after the Vincent Thomas Bridge was opened to traffic in 1963. The San Pedro Municipal Ferry Building is now a Los Angeles Historic-Cultural Monument and listed on the National Register of Historic Places. The museum is the largest maritime museum on the West Coast, although it lacks the historic ships other museums have. However, the World War II era tug Angels Gate is moored there, and the Battleship Iowa, now a museum with tours, is nearby. https://pacificbattleship.com/

In 1941, 3,000 first and second-generation Japanese lived on Terminal Island. Most worked in the fishing industry. Those not working on fishing boats worked in the many fish canneries that were clustered together on Terminal Island. Because Terminal Island was somewhat isolated, the Terminal Islanders developed their own culture and even their own dialect. The people called their close community village "Furusato" which translated literally means "old village". In February of 1942, Terminal Island residents were the first Japanese-Americans, on the West Coast, to be forcibly removed from their homes.

The Museum has a new exhibit that explores the life of the Japanese-Americans before the Internment. Their descendants wanted the exhibit to show their life before the Internment, to remember the good times, not the bad.

Other exhibits include a history of commercial diving in Los Angeles Harbor and a Navy Hall that features large ship models such as the U.S. Navy cruiser *Los Angeles* and the *SS Poseidon* model from the 1972 disaster film, *The Poseidon Adventure*. Upstairs are models of merchant ships such as the Silverpalm, square riggers, sail boats, and also a fully operational ham radio station.

The museum operates the tugboat *Angels Gate*, built in 1944 for the Army Transportation Service. *Angels Gate* was originally known as *ST-695*, and was among the fleet of tugboats designed for the World War II European theater. The fireboat *Ralph J. Scott*, a U.S. National Historic Landmark, is docked nearby.

Adjacent to the Museum, at the foot of 6th Street, is John S. Gibson Park, which includes monuments to the US Navy heavy cruiser *Los Angeles*, the Fishing Industry Memorial, the Bloody Thursday Monument, and the American Merchant Marine Veterans Memorial. (The Bloody Thursday monument commemorates the strife of the 1934 West Coast longshoremen's strike, which totally shut down all West Coast ports for three months.)

I hope to see you at the meeting on November 3, and that you will enjoy the museum.

Editor's Note

Juliet Rothman

It is a sincere honor to bring you this latest edition of *Calafia*, our Society's journal. The articles included here reflect the very varied areas of interest, knowledge, and expertise of our members and invited authors.

Michael Jennings has been an active member of our group, as well as an antique map dealer with a lifelong interest in cartography and mapping. He shares special details of his life and his work with us in the Meet our Members column. This edition's My Favorite Map features Ken Habeeb, whose favorite map is *Ischia Isola, olim Aenaria.*

From the University of Miami, Florida, Tim Norris shares with us his special area of interest—"participatory maps". Participatory maps are drawn and developed by local residents of a particular area, most especially native peoples, whose mapping reflects cultural knowledge, values, and ways of portraying the world and its features.

Participatory maps, often etched on the walls of caves, stones, or other, more ephemeral objects, have been created since the earliest development of humans, and are a fascinating area of study. From Dixie University in Utah, Janice Hayden introduces us to a specialized form of mapping—Hazard Maps. These maps define and demarcate areas whose natural geologic processes may present special hazards to habitation and development. In Utah, hazard maps are focused on rock formations—specifically rock cliffs which may at any moment crumble and release a huge amount of rock onto the ground below. Janice includes both maps and photographs of some of the damage these rock falls have caused, and cautions all of us to be aware of this potential and the mapping that may help avoid harm to persons and property.

From closer to home, RJ Andrews shares with us his special interest and skill: using creative arts and mapping sciences to develop ways of sharing information which is both educational and enlightening, as well as artistic and engaging. This article is an excerpt from his soon-to-be-published book, *Mapping Invisible Worlds: The Cartographic Origins of Data Visualization*.

Nicole Martinelli gives us insight into a very special and essential mapping process; discussing the development of three-dimensional maps for people who are blind or have limited vision thus enabling maximization of independence and self-reliance, so essential to us all. One of the fascinating aspects of this type of mapping is the challenge of scale. Features must be able to communicate specific information to the finger tips within a limited and specific space, and symbols must be consistent and predictable across maps.

Fred DeJarlais takes us on an intriguing exploration of underground mapping in urban areas and others where such mapping is essential, such as in mining, petroleum and natural gas exploration, archeology, and fiber-optics. He introduces us to 3-D technologies, necessary to address the ever-increasing complexity engendered by continuing development in all of these areas. Ground-penetrating radar, electro-magnetic induction, LiDAR, and reflection seismology have enabled much greater accuracy and higher resolution in underground mapping.

Leonard Rothman shares insights into the very special and unusual Airways Globe, a very early mapping of air routes across the world. It is interesting to learn the "hubs" of early air travel, as well as the destinations of the flights. The globe provides us with time frames for trips, which enable us to consider the much slower speeds of early airplanes, elevations for mountains, earth statistics, directions of winds, areas of cloud cover, and names and dates for explorers to both the North and South poles. Lavonne Jacobsen shares her work with Max Kirkeberg, whose collection of early photographs of San Francisco are classics. Kirkeberg groups these images by

developing his own subdivisions on a map of the city, and giving them non-traditional abbreviated names, if they were not already established. Gray Brechin shares a photo of a special project on which he is working—restoring a three-dimensional map of San Francisco with staff of SF MOMA.

Our President, Susan Caughey, shares her President's Message, and also has contributed our Apps for Maps article, what3words. She has shared this app as a special activity with a group of friends and has seen that it can create some interesting conversations and discussions. Mapping Here and There once again takes us on a journey around the world to special conferences, exhibitions, and mapping events, and the Carto-Quiz poses challenges that test the depth of our knowledge. And finally, A Hidden Gem explores the historical map collection conserved at the National Park Service's Maritime Museum in San Francisco. We have also included a review of our Spring CMS meeting, as well as of the local Bay Area Map Group meeting (BAMG).

I have reflected long and deeply on our President's letter in the last edition of this Journal, as she sought to find a balance between old and new—between the collectors of beautiful old maps which are in themselves truly works of art, in addition to informative representations, through the realms of the mapping of imaginary worlds, and the very real worlds of the planets and stars, to the modern world of aerial LiDAR, GPS, and other cartographic methods essential to the rapid technological advances of our society.

As many of you know, and all of you will learn, I am very far from an expert in maps and cartography. As I considered this important issue, and the essential need to understand mapping from a "multi-faceted" perspective, to use Susan's term, I wondered about the way in which "map" may be defined, and whether this definition might offer a clue, and a potential resolution, to the way in which we consider this field of special interest to each of us. I began by trying to research the current definitions of "map", and in a brief article, which will appear in the Spring edition, I hope my thoughts will initiate consideration and discussion on the part of our membership. I warmly welcome all insights, thoughts, definitions, and suggestions, in hopes that all of our sincere efforts will both strengthen and broaden us as a Society. It is the hope of both your editor and publisher that these will spark and potentially inspire some group discussion and consideration.

CARTO-QUIZ

Islands: Where are they? Names? Near or part of which countries?

9.7 sq. mi.

32.6 ac.

221 sq. mi.

7,172 sq. mi.

95.8 ac.

13,855 sq. mi.

California Map Society
Southern California Fall Conference
Los Angeles Maritime Museum
600 Sampson Way, San Pedro, California *helper.minding.stuff**
November 3, 2018

Agenda

9:30 to 10:15 **Morning hospitality**. Pastries, coffee, and tea

10:15 – 10:30 **Welcome** by VP-Southern California Jon Jablonski and President Susan Caughey

10:30 – 11:15 **Bill Warren**, *Los Angeles Harbor as a Man-made Phenomenon*. Bill was president of CMS from 1997 to 2000. He will use 19th and 20th century maps to show that Los Angeles was a very late adopter among world cities in being a major shipping port and having mass transit access to its airport. Bill contends that LA is the only major city in the world that had to retrofit access by water and public rapid transit to its airport. He will talk about the political battles of solving the harbor question in the early 1900's.

11:15 – 12:00 **Daniel Elroi**, *Modern Applications of GIS in Port Management*. Daniel is president & CEO of North-South GIS, an ESRI Gold Partner, which provides enterprise GIS services to the Port of LA and nine other major American ports. The Port of Los Angeles is the largest container port in the United States. Nautical operations, cargo transfer to trains and trucks, Customs and Border Control, firefighting and local law enforcement demand interoperability for sophisticated information systems that are tied to the Port's physical layout. That naturally demands a sophisticated set of digital maps. Daniel will describe the use of these geographic information systems.

12:00 – 1:30: **Lunch and museum visit**

1:30 – 2:15: **Fran Siegel**, *Translocation*. Fran is on the Art Faulty, California State University Long Beach. She will discuss the role of drawing as a form of mapping which interprets and translates information. Her projects, based on urban maritime centers begin with research, on-site notation and analysis of historical archives, maps, photography, and population growth patterns.

2:15 – 3:00 **Caleb Finch**, *Roadways to Accelerated Aging in Los Angeles*. Caleb is the ARCO Professor of Gerontology and Biological Sciences, University of Southern California. He will speak about digital mapping as an essential technique in evaluating and preventing the spread of disease. He believes that long-term disease risk can also be mapped.

3:00 – 3:15 **Break**

3:15 – 4:00 **Julie Sweetkind-Singer**, *Geographers at War: The Office of Strategic Services Mapping Program*. Julie is Head of the Branner Earth Sciences Library and Map Collections, and Assistant Director of Geospatial and Cartographic Services for Stanford University Libraries. The Office of Strategic Services was formed in June 1942. It brought together a number of experts, many from academia including many cartographers. These cartographers created thousands of maps on demand that either stood alone or were part of reports.

4:00 – 4:15 **Members' favorite maps.** Jon Jablonski will share a few highlights from the David Cole Transportation Collection at UCSB. If you would also like to share a map, please contact Jon at jonjab@ucsb.edu at least one week before the meeting.

4:15 – 4:30 **Business Meeting**

*www.what3words.com

Note: An extra agenda with map and directions, a meeting registration form and a member application/renewal form are included as inserts to this journal issue.

California Map Society Spring Meeting
Chabot Space & Science Center, Oakland, CA, April 21, 2018

The Society's Spring meeting was introduced by our President, Susan Caughey, and featured six fascinating speakers addressing very different aspects of the world of maps and mapping from ancient to modern times.

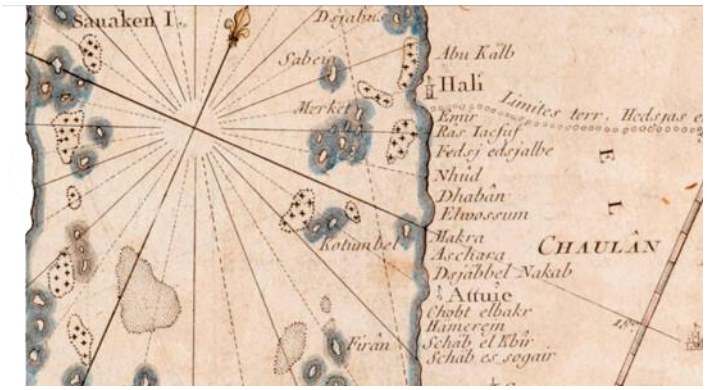
The first speaker, Michael Jennings, PhD, owner of Neatline Antique Maps, introduced this theme, presenting *The Developing Map: An Illustrated History of the Mapping of the Arabian Peninsula from Ptolemy to Google.* The Arabian Peninsula is the largest peninsula in the world, and is in actuality its very own tectonic plate, separated from the larger African plate nearby. It includes a chain of mountains along the Red Sea, as well as an "Empty Quarter"—the largest desert in the world. Cities are primarily located along the coasts of the peninsula, although Riyadh appears in the center.

Mapping in Arabia began with Ptolemy, and his treatise on Arabian cartography is actually the only one of his works to have survived from the ancient period. Impressive as it is, Ptolemy's work nevertheless dramatically warped the shape of the peninsula, especially in the South. These errors affected Arabian mapping through the Middle Ages. Ptolomaic ideas dominated cartography through the period of exploration from the 1400's through the first half of the 16th century. "Modern" mapping of Arabia began with Gastaldi in Venice; however, his internal topography is even less accurate than

G. Gastaldi, Il Desegno della Seconda Parte dell'Asia (Venice, 1561) Courtesy of Michael Jennings, PhD, Neatline Maps. (Portion)

Ptolemy's. Jan Huyghen van Linschoten, a Dutchman, took notes from Portuguese sources at the end of the 16th century, and created his own charts, including the first detailed chart of the Indian Ocean.

Mapping required two great costs: surveying (skill) and compilation (labor). Outdated material with minor changes was often used, sometimes with spelling changes, because it was less expensive. During the age of exploration, map details and accuracy have tended to reflect the importance—or lack of it—of the areas being mapped: they were more accurate where the focus was business and potential profit. Arabia's maps did not change much; they remained "shrouded in darkness" during this period. However, by the 18th century, travel and as-



Mare Rubrum seu Sinus Arabicus .... (Red Sea, detail). Carsten Niebuhr, 1774. Courtesy of Michael Jennings, PhD, Neatline Maps.

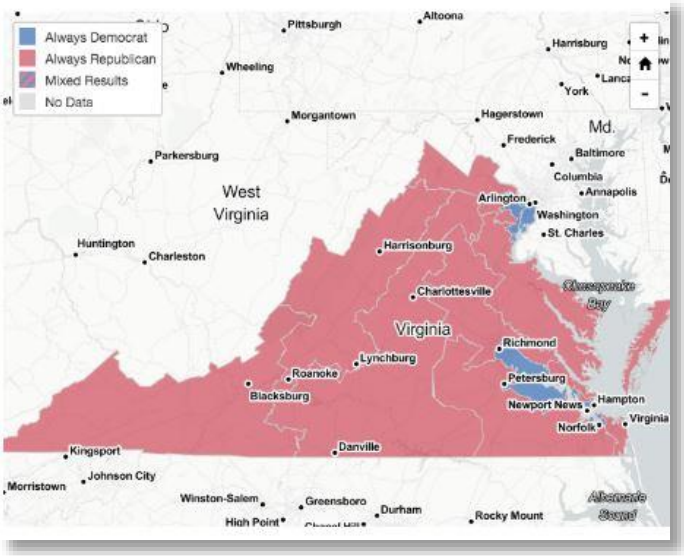
tronomical science interests promoted greater cartographic accuracy. The Danish explorer Carsten Niebuhr's 1761-67 expedition was very successful in mapping Arabia accurately; however, he was the expedition's only survivor!

Dan Rademacher, the Executive Director of *GreenInfo Network*, a non-profit that uses geospatial technology in support of the public interest and government agencies was the next speaker. He presented four examples of the work of the organization. The first of these was designed to address the issue of underage smokers by locating the areas of schools and the location of nearby cigarette retailers. Maps of school locations can be used for other purposes as well, such as disaster planning, where schools are often service centers. See http://www.californiaschoolcampusdatabase.org

The next example located parks, beginning with the necessary careful definition of a park. Various agencies, have parks; e.g., cities, regions, municipalities, home owners associations, recreational organizations, and others—13 of them locally—often with limited funds. Maps can assist in determining where funds may best be allocated. The California protected area database lists 15,000 parks and 1,100 agencies that manage them at parksforcalifornia.org. Greeninfo has also mapped traffic accidents, an important tool for determining where funding and interventions should be focused. NYC has

mapped accidents in real-time, and these can be accessed at NYC.crashmapper.com.

Dan's last example is especially relevant today: mapping partisan gerrymandering. GIS data can enable partisan distortion of



Portion of plate detailing political germandering in the State of Virginia

the democratic process, and partisan history has been mapped from 1972 onward, tracing gerrymandering over time.

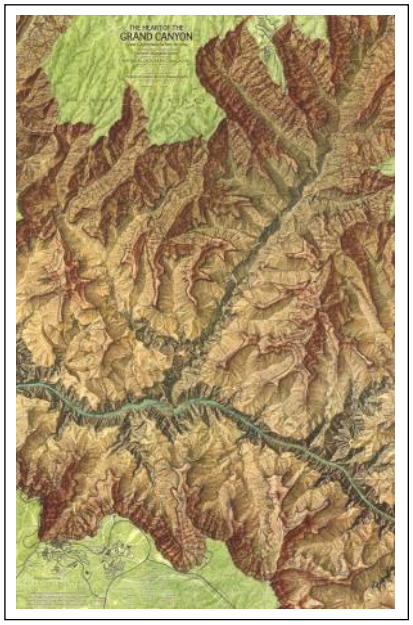
Our next presenter, Ronald Gibb, MD, specializes in maps and information related to the Revolutionary War. Wearing a tricorner hat, complete with a curly gray, very realistic-looking pony tail, Ron's presentation, *On the Brink of Disaster: George*

Plan of the Operations of General Washington against the King's Troops in New Jersey (emphasis on battle at Trenton)

Washington and the American Revolution, 1775-1776 took us on a whirlwind tour of the beginning of the American Revolution, with maps, troop movements, and wonderful portraits of the principal actors, from the early beginnings of the Revolution in New England, with Boston, Lexington, and Concord battles, then moving to New York City, with maps and battle sites in Manhattan and surrounding areas, including New Jersey, and finally to Virginia. Modern photographs with beautiful scenery and colors augmented the maps, and helped viewers to "see" the land areas. Ron included details of tactics, soldiers, loyalties, replacements, and the effects of the mercantile system on the war, creating a "civil" war in many senses, and affirming that American society was itself split between loyalty to the new government and the old. Not everyone, we learned, was in favor of independence from Britain.

This lively presentation was the source of much personal consideration. Each member became well aware of his or her knowledge gaps about this important period of history, of assumptions which were incomplete or inaccurate, as well as of the way in which the Revolutionary War was taught to him or her in childhood. It was truly an opportunity to learn!

After time for lunch and a quick visit to the Center itself and its telescopes, three additional very interesting speakers shared their presentations. Betsy Mason, co-author of the blog *All Over the Map* and co-author of the forthcoming book *Over the Map: A Cartographic Odyssey,* showed some of the special maps included in the book: a satellite map, a map of the sea floor, a map of bomb damage in World War II, and an intriguing map of an imaginary world. The primary focus of her presentation was a 1978 map of the Grand Canyon published through National Geographic. Until the late 1960's, there were no good maps of the Grand Canyon. In 1971, Bradford Washburn, head of the Boston Museum of Science, and his wife Barbara, decided to explore the area and determine what was needed for surveying and mapping 84 square miles of canyon and surrounds. They set survey control points and benchmarks and commenced surveying. Their original map was 400 ft. to the inch, but, by the time of completion, became 2000 ft to the inch. They obtained assistance and consultation from a Swiss mapping company, and, with them, expended a great deal of effort in the actual representation of features, us-



Bradford Washburn's Map of the Grand Canyon, 1978. See Cover also.

ing colorful landform shading and other techniques to illustrate elevation and contour details. This map can still be ordered from the National Geographic website. (https://shop.nationalgeographic.com/)

Betsey left us with a serious thought to ponder: GPS and modern technology have completely changed the field of cartography, as we all can recognize. In that change, something was gained—precise geographic coordinates and metadata, which provide much additional information, but something was also lost, Betsy thought—perhaps a direct and very personal connection to the terrain. She shared her thought that gains and losses accompany all changes, certainly something upon which we can all reflect.

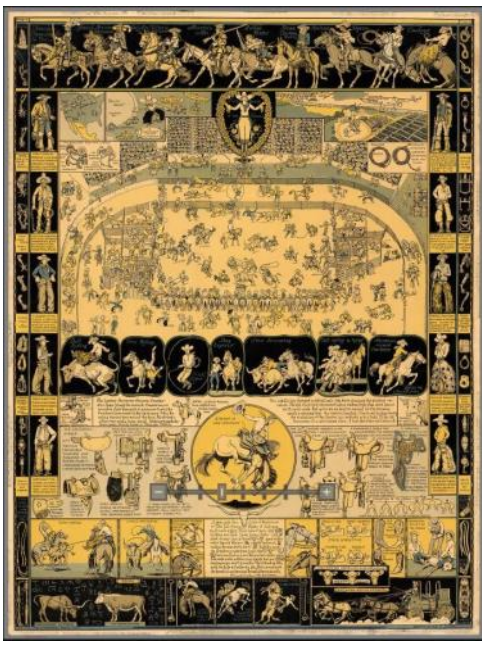
Our next presenter, Kate Anderson, is the only female professional land surveyor in San Francisco with her own firm, Vara Land Surveying. Land surveying, she shared, is a "very small profession" – yet a very necessary one.

50 Vara Blocks (137.5' x 137.5' x 6 in each block North of Market St. 100 Vara Blocks (275' x 275' x 3) South of Market St. (Portion William Eddy map, 1851)

Kate introduced us to the term "Vara". A Vara is a Spanish unit of measure, equaling 33 inches. Much of the original area of San Francisco was surveyed using varas – and those surveys and boundaries are still used today. In San Francisco's early days of the Presidio area, citizens could request a "50 vara lot" around the Presidio itself. However, not many people were interested in that area. The interest was in the Yerba Buena area, which is now downtown San Francisco. This area became known as the "50 Vara District", and lots were granted, and streets defined. Additional areas were laid out in 1847 by Jasper O'Farrell—following the old vara pattern of measurement. Kate showed slides of the layout of San Francisco to illustrate the vara plans. City Hall burned down after the earthquake in 1906, destroying all of the property deeds which had been kept there. Property owners were then issued "judgments" which defined lot lines, and these are still in effect today.

Surveys today are complicated: there are monument lines, and cuts in curbs and building corners which surveyors use to determine property lines. However, many of these have been destroyed or changed in some manner, creating "lots of inaccuracies" in land surveys in the city. Surveys are necessary to determine property ownership, and even owners of condos in high rises must have surveys "in the air" to determine and define property boundaries. Kate showed us some of her own survey maps to illustrate how surveys are done and recorded today.

Our last speaker, Peter Hiller, is the curator of the Joseph Jacinto "Jo" Mora collection, and presented *The Life and Work of Jo Mora.* Mora lived from 1876 to 1947, and was a true "Renaissance man"! He was an architect, an actor, a sketch artist, and illustrator of books, a cartoonist, a writer, a painter in watercolors, a sculptor, etcher, muralist, hunter, cowboy/horseman, diorama creator, photographer, and designer of the coin for California's 75th anniversary. He spoke French, Spanish, Latin, Greek, and English, and had lived for a period of time with Native Americans. He trained as a soldier during WWI, but it ended before he was deployed. He was a family man, with a wife and two children, and supported his family entirely with his arts.



Evolution of the Cowboy, Jo Mora, 1933. David Rumsey Map Collection. ("Sweetheart of the Rodeo" image, top center)

Of especial interest to our members, Mora was also a cartographer, making both pictorial and commercial maps. He was not trained in mapmaking, and often added special components to his maps—embellishments such as cartoons, buildings, designs, birds, animals, scenery, landscapes, and people, all in bright colors. He often created his maps in stages: first black and white drawings, then color, then embellishments. He loved California and California history, and Peter shared many examples of his maps, including one of Los Angeles with a special decorative border, one of Carmel in bright colors, three national park maps—of Yosemite, Yellowstone, and one the Grand Canyon, Sweetheart of the Rodeo, and one of Indians.

A brief business meeting followed the presentations. The meeting included the election of officers for the coming year and a membership report.

By Juliet Rothman

USING GEOLOGIC MAPS TO DELINEATE LOCAL HAZARDS, PARTICULARLY ROCK FALLS

Janice M. Hayden, Certified Professional Geologist
Dixie State University, St. George, UT

Geologic maps present a huge volume of geologic data usually on one or two pieces of paper. "A detailed geologic map shows what it is you are standing on; where similar rocks or sediments may be found; how old they are; what they are composed of; how they formed; how they have been affected by faulting, folding, or other geologic processes; and what existing or potential mineral resources and geologic hazards are nearby." (Biek, R.F.) Detailed geologic maps can be used to develop more specific Geologic Hazard maps. A geologic hazard is a geologic condition that represents a threat to human life, welfare, or property. Most geologic hazards, such as rock falls, earthquakes, landslides, problem soils, and floods, are low probability events —but low probability geologic hazards affect the built environment almost every day. Unfortunately, many individuals, municipalities, planners and developers are often either not aware of these maps that would help prevent property and life loss, or choose to ignore them. Obviously, the best way to deal with these potential hazards is to recognize and avoid them in the first place. The scope of this article will be to explore the hazards of rock falls using geologic maps through the presentation of several incidents, which might have been avoided had Geologic Hazard maps been utilized in determining the location of homes and other built environmental features.

Rock fall is a natural mass-wasting process that involves the dislodging and downslope movement of individual rocks and rock masses. Rock-fall hazards exist where a source of rock is present above slopes steep enough to allow rapid downslope movement of dislodged rocks by falling, rolling, and bouncing. The potential hazard is based on a number of factors, including geology, topography, and climate. Rock fall sources include bedrock outcrops or boulders on steep mountainsides or near the edges of escarpments such as cliffs, bluffs, and terraces. Rock falls are initiated by freeze/thaw action, rainfall, weathering and erosion of the rock and/or surrounding material, and root growth. Rock fall is also the most common type of mass movement caused by earthquakes.

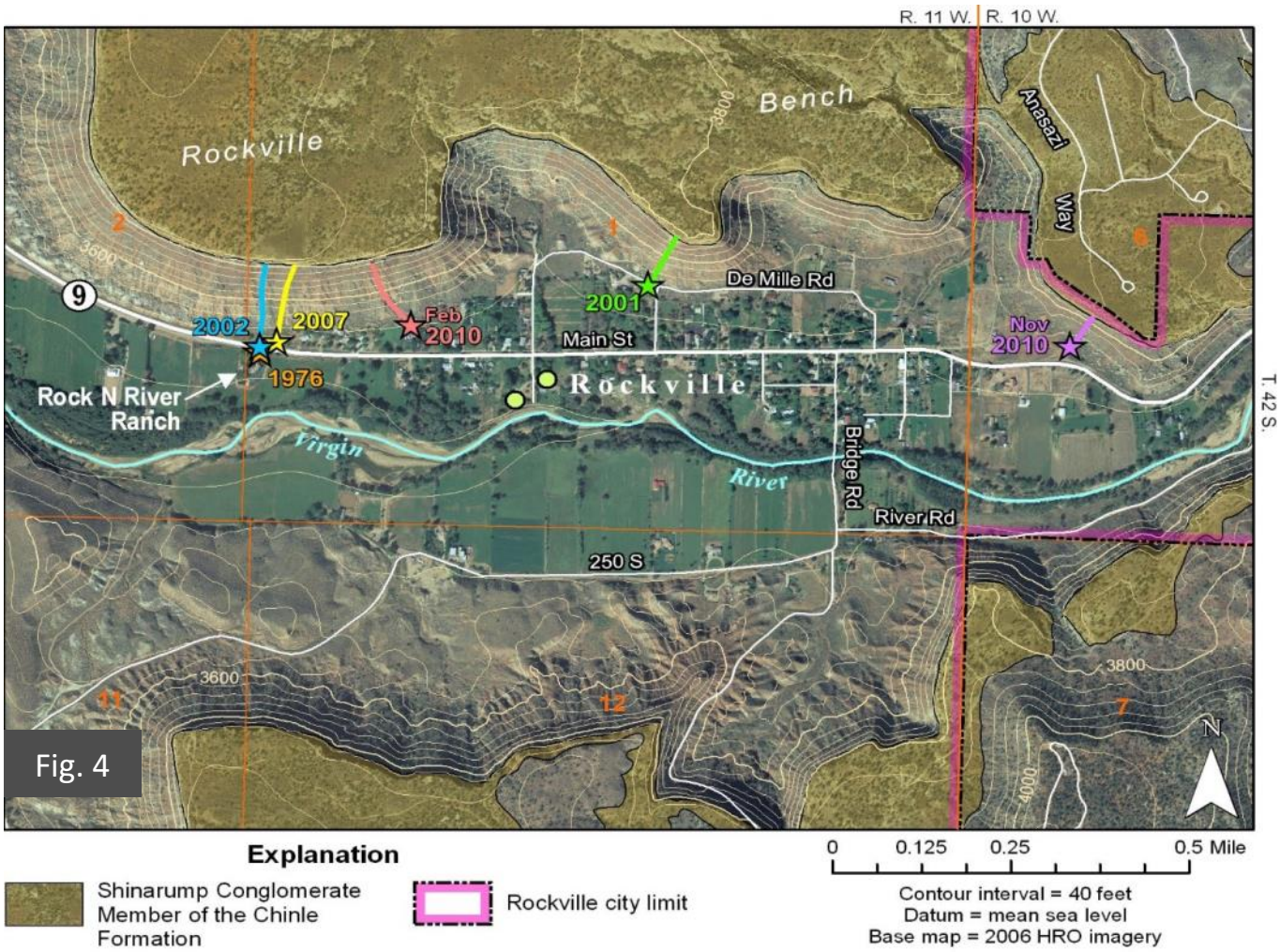
On December 12, 2013, a block of sandstone broke loose from the Rockville Bench ledge in Zion National Park. It fell some 375 feet to the base of the slope below, then continued to travel, about 750 feet total. Some pieces even rolled across the highway below the ledge. The massive boulders crushed a home and a free-standing garage at the base of the slope, killing both residents. It was estimated that the rock fall mass totaled 2700 tons. (Lund, Knudsen and Bowman) This location is within the mapped high rock-fall-hazard area, with the initial hazard maps that were available to the town and public being compiled in 2011 from the 2002 detailed geologic map. The before and after photographs are simply stunning. This is only one of many rock falls in the area.

Approximately 40 miles to the southwest of Rockville, the St. George-Hurricane area has available, in addition to detailed geologic maps, a set of 14 maps that delineate various geologic hazards including: Surface Fault Rupture, Liquefaction, Flood, Landslide, Rock Fall, Expansive Soil & Rock, Collapsible Soil, Gypsiferous Soil & Rock, Breccia Pipe & Paleokarst, Shallow Bedrock, Caliche, Wind Blown Sand, Piping & Erosion, and Shallow Ground Water. (Lund, Knudsen, Vice and Shaw) Many incidents related to all of these geological hazards have created havoc within the built areas.

A portion of Plate 3, the Rock-Fall-Hazard map, from Geologic hazards of the State Route 9 Corridor, LaVerkin City to Town of Springdale, Washington County, Utah. (Knudsen and Lund) Red=High, Yellow=Moderate, Green=Low hazard areas. Blue arrow shows the location of the December 12, 2013 rock fall in Rockville, Utah. Note that the hazard area extends across the highway, shown as a dark red line. Lighter red lines delineate sections (one square-mile) for scale.

One of these occurred in 2012, within a high hazard area on the west side of the map. (Fig. 7) A large block of rock from

Before (Sept 29, 2010) and after (Dec 12, 2013) photos of a home and free-standing garage in Rockville, Utah that were crushed by a massive rock fall December 12, 2013. Use the vehicle, nearly the same size in both photos, for scale. (Lund, Knudsen and Bowman) In the before photo, note the ledge of sandstone capping the hill behind the home and additional rock fall blocks in front of the home that were emplaced by an earlier rock fall and used as part of the landscaping.



The Town of Rockville has experienced several significant rock falls over the last few years. (Lund, Knudsen and Bowman) Note that the Dec. 12, 2013 rock fall occurred on the slope between the 2007 (yellow) and Feb. 2010 (red) falls.

Fig. 5

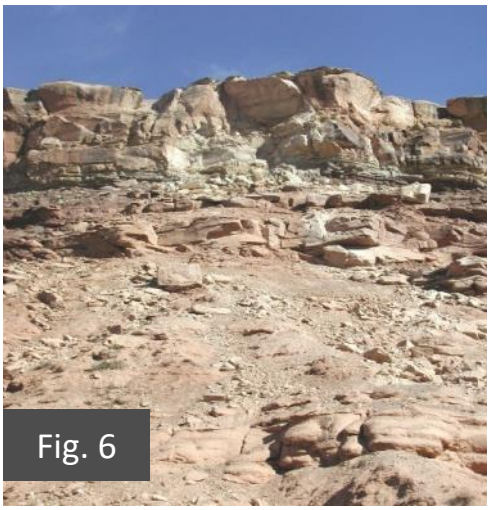


Fig. 6

A rock fall damaged this home in Rockville, Utah in 2001. Note the light scar on the hillside that marks where the rock came from. (Photos Dave Black, Rosenberg and Associates Engineering.)

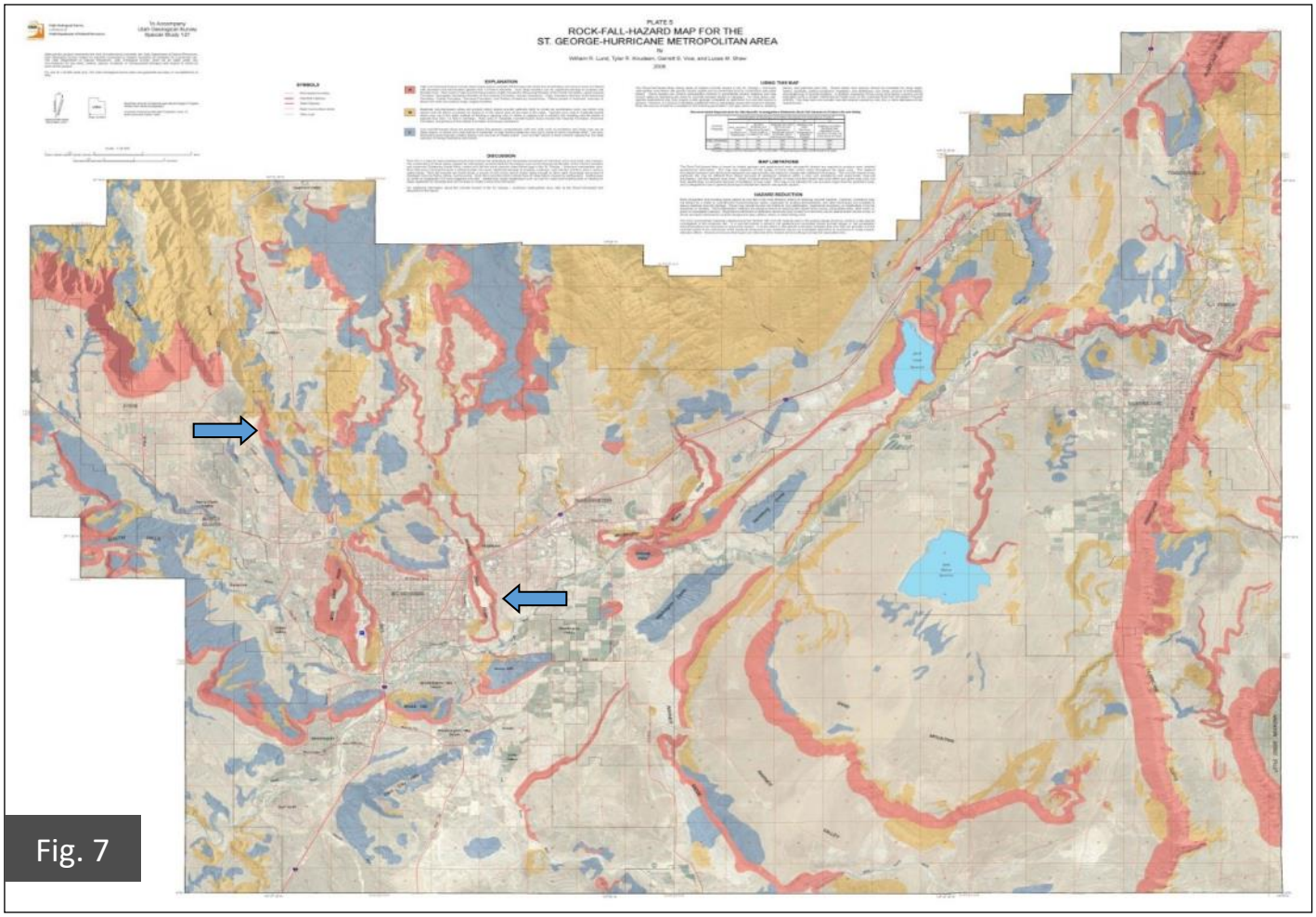
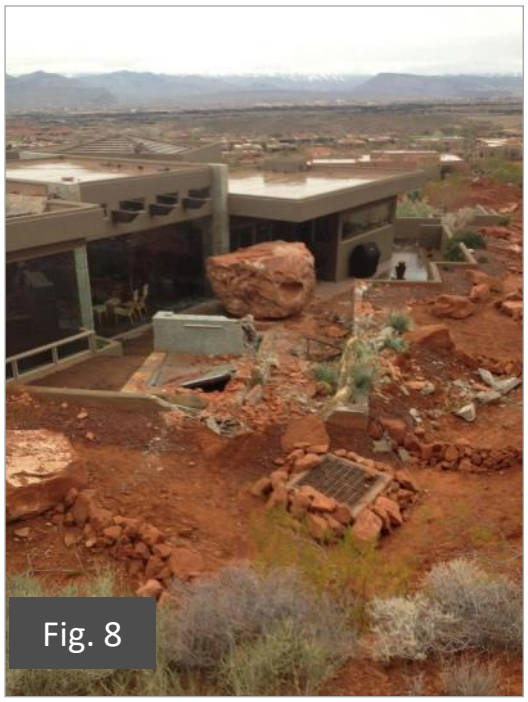
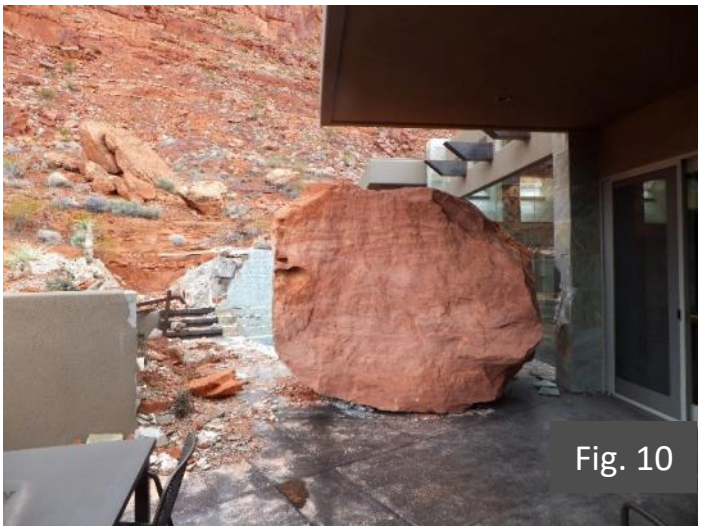


Fig. 7

Rock-Fall-Hazard map (Plate 5) from Geologic hazards and adverse construction conditions, St. George-Hurricane Metropolitan Area, Washington County, Utah (Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M.) Scale 1:24,000, but again, each square outlined in light red is a section (one square-mile). Red=High, Gold=Moderate, and Blue=Low Rock-Fall-Hazard potential areas. Blue arrows show the location of two significant rock fall areas. Note that there are many slopes in the area that have Rock-Fall-Hazard potential.



Looking downslope and upslope at the site of a rock fall in St. George, Utah in 2012. Note the lighter color of the scar at the base of the cliff and the debris track down the hill.



Seven-foot tall sandstone rock fall boulder rests on the patio next to the damaged pillar that stopped its forward progress after it fell and rolled down the hill, then through the walls of the pool and hot tub of this home.

the base of Navajo Sandstone, the rock formation that makes Zion National Park so famous, popped off the hillside and fell, bounced, and skipped down the slope . It jumped over the first two small fences before rolling through the rebar-reinforced concrete walls of a pool and a hot-tub and hitting the back pillar of a home. The owners were lucky that it hit the pillar rather than rolling through the floor-to-ceiling windows right into their home! At the time of the rock fell, this home was on the market for $1.7 million. In a matter of a minute, it became practically worthless. It was sold months later for pennies on the dollar and repaired. Apparently, those who bought it can still sleep well at night!

At the site of the easternmost arrow on the Rock-Fall-Hazard map (Fig. 7) for the St. George-Hurricane area, a boulder of old stream channel conglomerate broke off from underneath the 1.4 million-year-old basalt that caps the hillside and rolled into the back corner of a home in 2013. In the early hours of the morning, the owner, who was home alone at the time

Photo showing the large rock fall block that crashed into the master bedroom corner of this home that is built at the base of a hill. (Photo Dave Black, Rosenberg and Associates Engineering.)

Oblique-aerial photo of the hillside taken in 2009 with arrows pointing to the area of the future rock fall and lot where the home will be built. Note the cut into the base of the hill to accommodate the approved subdivision. (Photo Dave Black, Rosenberg and Associates Engineering.)

View looking back up the hillside-cut to the source area for the rock fall block that rolled in 2013 into the corner of the house now built on the empty lot shown in 2009 above. (Photo Dave Black, Rosenberg and Associates Engineering)

thought she heard something and rolled to the opposite side of her bed to get up and check. The rock hit the corner of the house, which lifted the bed and knocked her into the wall, breaking her collarbone. It could have been much worse had she decided to get out of bed on her usual side! Again, a detailed geologic map of this area was available by 1996, and the specific geologic hazard map was available to the public by 2008. This incidence also occurred in a mapped high rock fall hazard potential area.

After years of working for the Utah Geological Survey making the geologic maps for this area, mostly at the 7½ minute quadrangle, 1:24,000 scale, it is disheartening to see that there seems to be such a limited use of this resource. Most individuals assume that if a governing body, such as a city, has approved a plat and issued a building permit it is geologically safe to build there and that simply isn't always the case. The buyer should be thorough in doing "due diligence" on the proposed property purchase. It may be a matter of life and death!

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2 **Knudsen, T.R., and Lund, W.R.** (2014) Geologic hazards of the State Route 9 Corridor, La Verkin City to Town of Springdale, Washington County, Utah: Utah Geological Survey Special Study 148, 13 p., 9 plates, GIS data, DVD. Plate 3.

3 **Lund, W.R., Knudsen, T.R., Bowman, S.D.** (2014) Investigation of the December 12, 2013, fatal rock fall at 368 West Main Street, Rockville, Utah: Utah Geological Survey Report of Investigation 273, 20 p.

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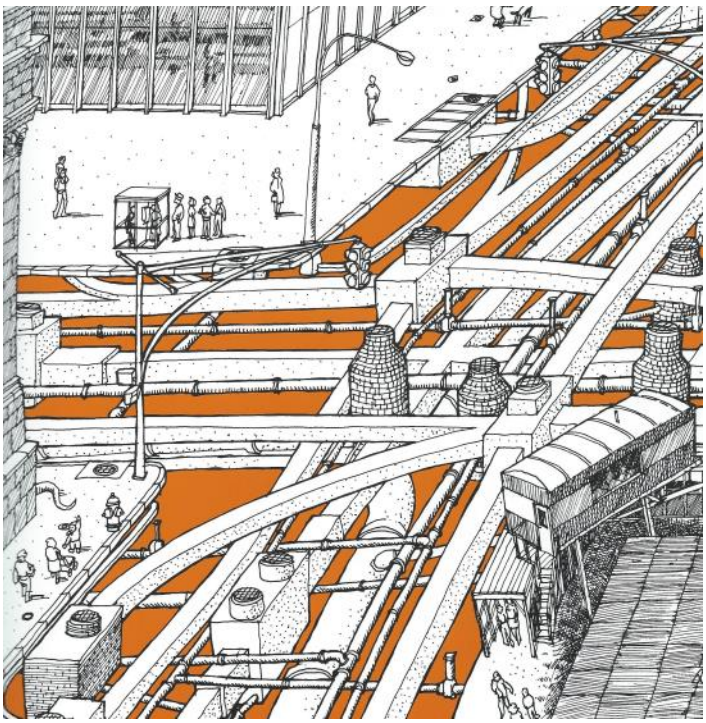
Underground Mapping

Fred DeJarlais



Cover image, Underground, David Macaulay, 1976

WHERE IS THAT CABLE TELEVISION LINE?

While I was working on a housing site in Wellingborough, Northamptonshire, UK in the early 1970's, our construction crew severed a CATV line serving an adjacent subdivision, not once, but 17 times! Our neighbors were not pleased. Decades later, I lived but a couple of miles from a far more serious incident, one which killed five workers and involved the severing of an incorrectly plotted natural gas line.

San Francisco Historic Watercourses, Mission Creek & Mission Bay
Seep City Water Exploration Map, Joel Pomerantz, 2017

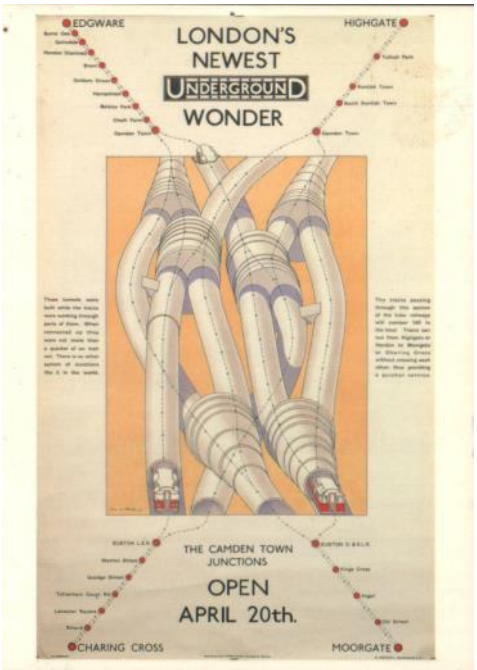
The accurate mapping of underground utilities has become crucial to our increasingly interdependent and urbanized society. And new technologies are being developed to assist engineers and planners to precisely locate existing underground facilities and to help in the design and construction of new utilities and structures in increasingly congested corridors.

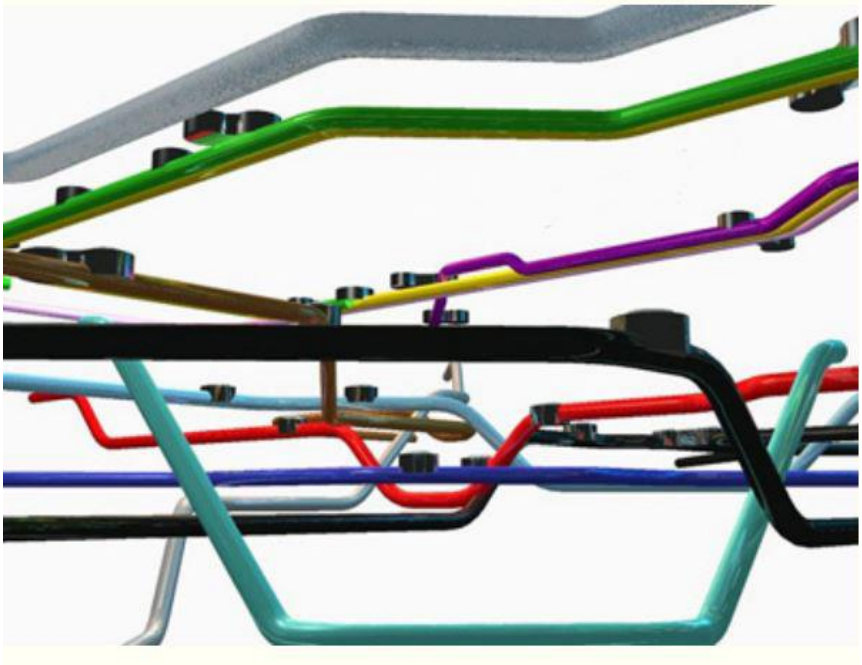
The need for accurate subsurface mapping, however, is not confined to the urban environment. Mining, petroleum and natural gas exploration and conveyance, archaeology, fiber optic telecommunication cables (both on land and on the ocean floor) are all areas which require sophisticated mapping operations. The urbanization of our planet has also obscured some of our natural resources, especially historic watercourses. The mapping of these former creeks and rivers, now subsumed and diverted, has brought public attention to these resources and led to restoration efforts in many jurisdictions in the US and abroad.

Until recently, the depiction of underground facilities has relied on conventional 2-dimension cartography ('2-D'). With the advent of Geographic Information Systems (GIS) and the Global Positioning System (GPS), these 2-D maps have become "smarter," with meta-data linked directly to the drawing elements (e.g., size of main, elevation of invert, etc.) and with precise latitude, longitude and elevation of the feature being plotted. The location of utility features on the surface has become more accurate with the help of GPS data collectors. And programs such as ArcGIS provide a means to geo-reference this info, linked to databases and able to display infrastructure elements in 2 and 3-D formats. However, the features underground still rely on construction plans and historic records, perhaps decades old, for location, size and capacity.

The increased complexity of the underground utility and transportation maze in crowded urban streets has led to an increased reliance on 3-D technologies. Computerized systems, initially employed in complex architectural projects like hospitals and refineries, are now being used to visualize subsurface features.

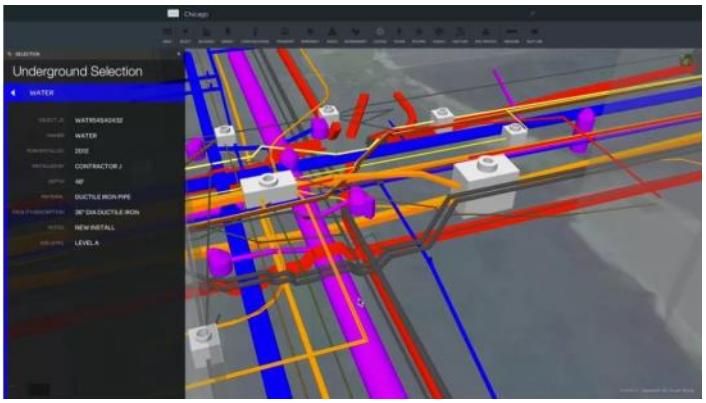
A typical downtown street, say in San Francisco, might contain storm and sanitary sewers (in the case of San Francisco, these are often combined sanitary and storm lines), electric transmission and distribution lines (sometimes very high voltage lines serving entire neighborhoods), communication lines serving fire alarm boxes, low pressure water lines, high pres-





Two 3-D views of the London Underground: Left; new station poster, circa 1930's. Right; Visualization by Corey Clarke, 2003

sure water lines (sometimes with a large water cistern in the intersection), reclaimed water transmission lines, high and low pressure natural gas distribution and service lines, steam conduits, fiber optic telecommunication cables and pneumatic tube conveyance conduits (in hospital areas). And, in the case of Market Street, a two-level transportation tunnel containing Muni Metro and BART trains. So, the need for a three-dimensional model of this infrastructure is paramount when planning for new infrastructure to be placed in this environment. The city of Chicago is embarking on such a mapping system. The city estimates that each year there are 100,000 projects that involve excavation in their streets. This system, the *Underground Infrastructure Mapping Platform*, will allow for testing design options prior to construction with a clear, precise depiction of the physical constraints and should reduce expensive and perhaps hazardous surprises during construction. Some planners expect a savings of up to 50% in construction times.[1]



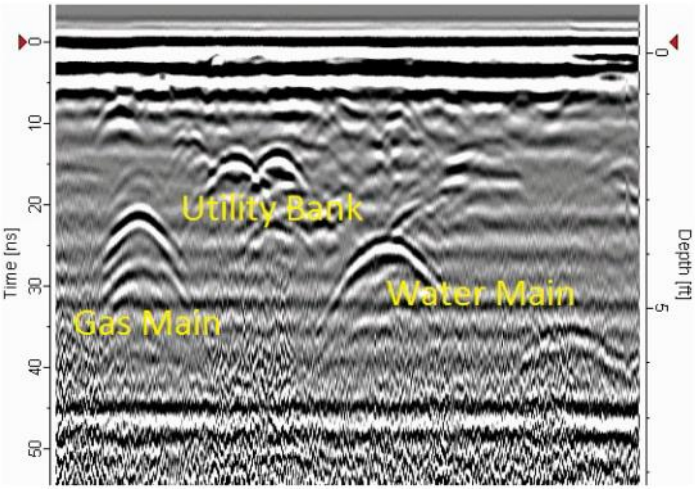
Chicago's Underground Infrastructure Mapping Platform, 2017

NEW UNDERGROUND DETECTION TOOLS

New tools and new uses for older technologies have been developed to detect the actual location of underground utilities and other features. These tools can then also be used in conjunction with historic records to arrive at a higher level of confidence in the horizontal and vertical position of these elements.

Ground penetrating radar

Ground-penetrating radar (GPR) is a geophysical method that uses radar pulses to image the subsurface. Though often



Unprocessed imagery from Ground Penetrating Radar project

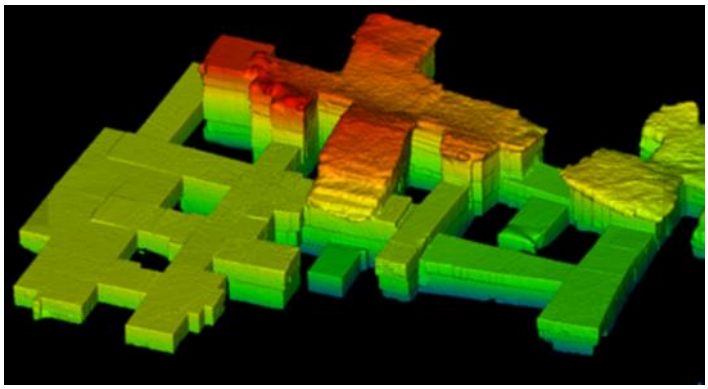
thought of as a new technology, GPR was invented in the early 1900's and successfully used to measure the depth of a glacier in 1929.[2]

This nondestructive method uses electromagnetic radiation in the microwave band of the radio spectrum, and detects the reflected signals from subsurface structures. GPR can have applications in a variety of media, including rock, soil, ice, fresh water, pavements and structures. In the right conditions, practitioners can use GPR to detect subsurface objects, changes in material properties, and voids and cracks.[3]

Ground penetrating radar, beginning in the 1990's, has been instrumental in revealing important archeological features in Yucatán, Mexico, particularly in the ancient city of Chichen Itza. GPR can disclose features up to 4 meters beneath the earth's surface and is not affected by vegetation on the surface.[4]

Electro-magnetic induction

This tool is not useful for non-magnetic materials but can be used successfully in conjunction with GPR. It's sometimes necessary to excavate to locate a utility line, at times using a powerful vacuum excavator to reduce the size of the excavation.



LiDAR Mine imagery, New York State, H2H Associates

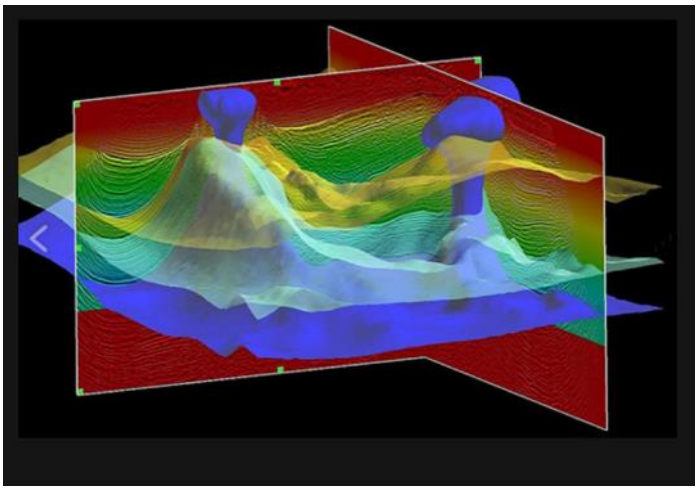
LiDAR

LiDAR (Light Detection and Ranging) is a surveying method that measures distance to a target by illuminating that target with a pulsed laser light, and measuring the reflected pulses with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3D-representations of the target.[5]

LiDAR is commonly used to make high-resolution maps, with applications in geodesy, mining, geomatics, archaeology, geography, geology, geomorphology, seismology, forestry, atmospheric physics, laser guidance, airborne laser swath mapping (ALSM), and laser altimetry. The technology is also used for control and navigation for some autonomous cars.[6] Compared to traditional data collection, such as topographic surveys using theodolites, LiDAR collects geo-referenced points at the rate of perhaps 500,000 points per second,[7] creating a huge point "cloud" of data. Only with the tremendous increase in computing power and the rapid reduction in the cost of storage is it possible to resolve this universe of points to manageable size suitable for the preparation of usable 3-D imagery.

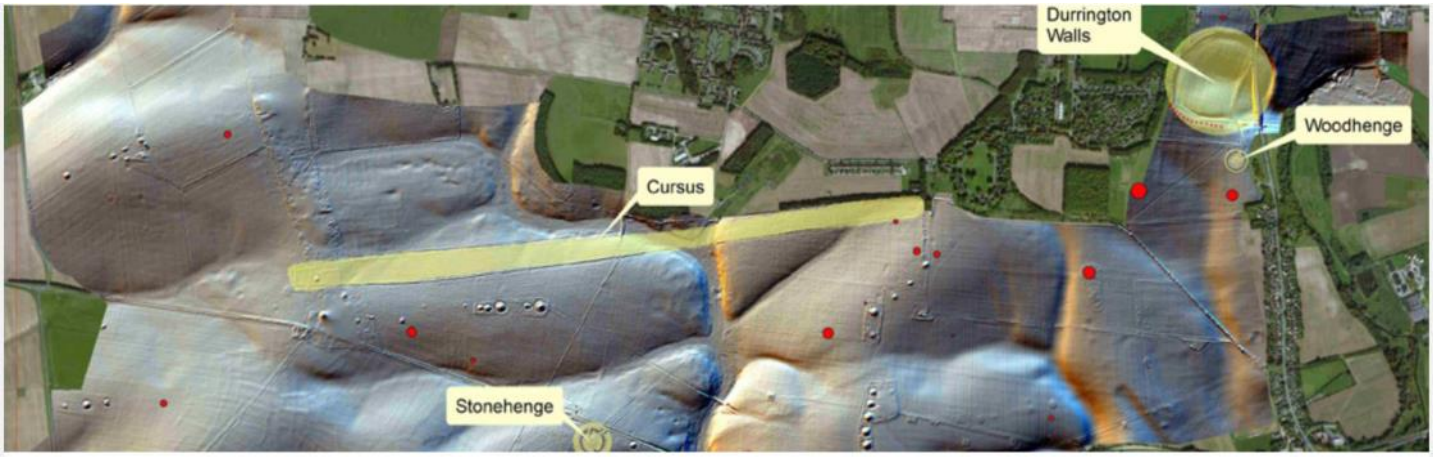
Reflection seismology

Reflection seismology (or seismic reflection) is a method



Seismic reflection project revealing underground salt deposits

Nottingham Castle:
To capture these strange digital imprints of vast underground spaces, the Nottingham Caves Survey crew hauls equipment below the surface on bike trailers. The scanners send beams of laser light deep into the caves and measure the amount of time it takes for the light to return. The scanners can capture an incredible 500,000 survey points per second, creating a 'point cloud' that results in a 3D image.[9]



Stonehenge underground surveys:
Some underground projects can use multiple technologies such as aerial photography, LiDAR, airborne imaging spectroscopy, magnetic prospection, ground-penetrating radar and electromagnetic induction.[10]

of exploration geophysics that uses the principles of seismology to estimate the properties of the Earth's subsurface from reflected seismic waves.[8] This technology is particularly useful for hydrocarbon exploration and studies of the earth's crust.

Just as we live and work in a 3-D world above ground, technology is beginning to provide the tools that accurately depict the world below—providing images that reveal the artifacts of ancient civilizations, mineral resources that fuel our economies, geological data that uncovers the origins of our planet and that can produce a three-dimensional framework for the safe and cost-effective design and construction of the infrastructure that supports human society.

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Apps for Maps

What3words App Remaps the World

Susan Caughey

So, your daughter is getting married on a beach in Hawaii. How in the world are you going find it? There's now an easy solution and it's called *what3words*.

The app was conceived by a young British music promoter who had trouble getting his bands to the right location for their gigs. He tried giving them coordinates but that was too complicated and difficult to communicate. Some places they needed to be didn't have addresses—like the wedding on the beach. He and a mathematician friend scratched their heads and what3words was born.

What they did was to create a grid of 3-meter squares—some 57 trillion of them—over the entire globe and give each square a unique 3-word address. Similar 3-word addresses were assigned to different parts of the world, so if an address is entered incorrectly, the mistake is immediately noticeable. For example, the address of where I am sitting to write this is *dancer.drillers.stateroom*, and a similar address *dancer.drillers.state,* is near Derby, Western Australia. Even the oceans have addresses. What3words is currently available in 26 languages.

Mongolia was the first nation to adopt what3words as its nationwide address system. Now every yurt in the countryside has an address and people can receive mail and deliveries

as never before. As of September 2017, Kiribati was the eighth country to adopt what3words as its address standard, along with Mongolia, Sint-Maarten, Côte d'Ivoire, Djibouti, Tonga, Nigeria and Solomon Islands.

What3words can find a wedding on the beach as well as direct emergency services to an accident. The use of drones is changing the face of many industries and services, from crop inspection or fire reconnaissance to emergency medical response and aid drop off. The UN already uses what3words during disaster recovery.

What3words is also the framework that is making voice-activated navigational systems possible. Mercedes Benz has recently adopted it as the basis of its new nav system.

In an interview Chris Sheldrick, CEO and co-founder of what3words said "Traditional street addresses just were not built for voice input. 15 Ammanford Road and 50 Ammanford Road are hard for a voice system to distinguish between and many house names and road names aren't unique. There are 14 different Church Roads in London, and 632 Juarez streets in Mexico City. Street addresses also use thousands of non-dictionary words, the pronunciation of which can be near impossible to guess. The [British] town of Godmanchester, is actually pronounced 'Gumster'. A three dictionary-word address solves the problem."

Travelers can input an address in the local language or in their own language; whichever one they use will take them to the right location.

Each what3words language uses a wordlist of 25,000 words (40,000 in English, as it covers the oceans as well as land). The lists go through multiple automated and human processes before being sorted by an algorithm that takes into account word length, distinctiveness, frequency, and ease of spelling and pronunciation. Similar-sounding words and variant spellings are minimized to eliminate confusion, and offensive words are removed.

The what3words algorithm actively shuffles similar-sounding three-word combinations around the world to enable both human and automated error-checking. The result is that if a 3-word combination is entered slightly incorrectly, and the result is still a valid what3words reference, the location will usually be so far away from the user's intended area that the error is quickly recognized.

The what3words system uses a proprietary algorithm in combination with a limited database, meaning that the core technology is contained within a file around 10 MB in size.

No internet service is required! As the system relies on a fixed algorithm, not on a large database of every location on earth, it works on devices with limited storage and no internet connection, and the encoding is permanently fixed and unchangeable. This makes it hugely useful in developing nations.

Using what3words: The app is available for I-phones and Android. Download the app. You can access known locations the same way as in Google maps. Type in David Rumsey Map Center and the what3words grid pops up and shows its address as *blaze.frock.palms*. Change to a satellite view and you can clearly see that the Rumsey Map Center is located near the SE corner of the Green Library. You can then move the pointer to the Library entrance.(*third.star.shack*) and then click on the directions symbol. It will give you a choice of using Google Maps, a Compass or GPS find me. If you're driving, choose Google Maps and you're on your way. If you're already on campus and parked, choose the Compass, which turns your cell phone into a large compass. You then can simply follow the arrow to the Green Library entrance.

The one thing what3words can't do is to get you to the right location in a multi-floor building so it can't get you all the way to the Rumsey Map Center. You are forced to give up all technology and follow the old-fashioned wall signs.

My Favorite Map

Kenneth Habeeb

Three or four years ago, I bought a European (actually Italian) islands map that had something going for it that I couldn't exactly nail down to one feature.

An obvious attraction was its bright hand-coloring. It also had several small cartouches, nearly one in each corner, and sailing vessels. Map collectors are justly drawn to sailing vessels, not just for their decorative appeal, but also because they indicate shipping routes. And in their size and style they represent country of origin and the sailing technology of the period.

But this map is special because of its bird's-eye view—a fairly early one at that.

It is called *Ischia Isola, olim Aenaria*. It measures 15 by 19 inches, and it represents mainly the volcanic island of Ischia, located in the Tyrrhenian Sea, at the northern end of the Gulf of Naples. We also see a portion of the Naples coast nearby. The satellite lands are the island of Procida and the Peninsula of Capo Miseno.

The map is oriented with north at the bottom. There are towns, rivers, and fields of planted crops on the island, shown in fine detail. Forests and mountains are rendered in profile with the highest peak of Mount Epomeo towering over everything else, possibly out of scale. Also delineated are individual buildings, including the medieval Aragonese Castle standing on a volcanic rocky islet that connects to the larger island of Ischia by a stone bridge.

First published by Ortelius in 1590, this map and view was included in his fabulous Theatrum Orbis Terrarum atlas. The map was also important or salable enough to be re-used or even re-engraved by some of the most important cartographers alive over a fifty-year period following Ortelius. There are versions by Willem Blaeu, Schenk and Valk, Jansonius, and Hondius during the Dutch Golden Age of the 17th century. Why all the fuss? That's a good question!

Ischia's location is important militarily, but the island did not suffer occupants gladly. If you wanted to enjoy the island's many hot springs, which first attracted the Romans, you had to deal with the possibility of volcanic or seismic activity. The Romans abandoned the island for just that reason, as had several settled populations earlier. No sense locating Roman baths in a place rife with the possibility of geothermal annihilation tomorrow.

Not looking hard for clues to the Roman departure, the Visigoths (barbarians) from the north, favorite nemeses of said Romans, took their turn. They were followed by warring Saracens, Normans, and then the nearby Italian dukes of Naples and other area fiefdoms who took their vacations there for several hundred years until the island was shaken by a very large earthquake in 1228, only to set up the inhabitants for a volcanic eruption in 1300.

Ortelius' Ischia, www.sanderusmaps.com

Blaeu's Ischia, www.sanderusmaps.com

Continued at FAV MAP, page 23

Maps at your fingertips:
the challenges and future of tactile maps for the blind

Nicole Martinelli

This isn't the first time Frank Welte finds himself in front of an audience that doesn't know how to read a map. He stands up and presses the thick 11" X 11.5 paper map across his torso on a diagonal. The right hand holds one corner steady; with the left he navigates a slice of San Francisco's South of Market neighborhood.

"The first thing I'll do," he tells the assembled graphic designers, user experience experts, and urban planners during a two-hour workshop, "is start at the upper left, to see what the title of the map is, find the scale and locate north." This three-page black and white map shows the area around Market Street where Welte, who is blind, works as an accessibility media specialist at LightHouse for the Blind and Visually Impaired. Without adding a crinkle to his blue dress shirt, he speeds to the center of the map for the "you are here" cluster of dots in a circle,

Tactile map, vicinity of San Francisco City Hall

finds Market street and starts tracing parallel streets, using the key on the pages behind it to locate street names.

Participants at the workshop, held during San Francisco Design week, learned that the number of people who could benefit from tactile maps depends on how you define vision loss, as well as on when the survey was taken. An estimated 25.5 million adult Americans (or about 10% of all adults) reported they either "have trouble" seeing, even when wearing glasses or contact lenses, or that they are blind or unable to see at all, according to 2016 National Health Interview Survey (NHIS) data. Worldwide, there are 253 million visually impaired people.

Navigating your surroundings, however, is a basic right that isn't yet recognized, even by the Americans with Disability Act (ADA). However, to participate in today's society, you need access to information, says Greg Kehret, director of LightHouse's Media and Accessible Design Laboratory (MAD Lab). Whether it's using a microwave, the washing machine, or an ATM, the blind or visually impaired get "cordoned off through bad design." Braille and tactile maps have proven useful but until now have been difficult and costly to design, manufacture, and distribute.

The San Francisco-based nonprofit, LightHouse for the Blind and Visually Impaired, wants to change that situation with Tactile Maps Automated Production (TMAP), a tool for on-demand tactile street maps. Developed with the Smith-Kettlewell Eye Research Institute, TMAP is an accessible, web-based app that uses Google maps search information and OpenStreetMap data to generate tactile and visual representations of streets centered on a user-specified location. Using design parameters to ensure tactile legibility, TMAP quickly and cheaply generates tactile map files compatible with a variety of printers and embossers.

The lack of awareness about the importance of tactile maps has created some design challenges along the way. For starters, there are no established universal symbols for these maps. "If you put your hands on a tactile image and you don't have any training, it can feel like just a mass of lines and be very confusing. We're here to make it less so," says BJ Epstein, a project manager at MAD Lab. Using the idea of abstract concepts rather than mimicking real-world objects, the team has crafted tactile maps and wayfinding tools for clients including UC Berkeley, Bay Area Rapid Transit, Calgary Transit System, and a number of music festivals.

"TOO MANY RECTANGLES"

Take, for example, a typical transit station: "There are rectangles for signs, there are rectangles for shelters, there are rectangles for benches. That's too many rectangles. So circles represent benches," Epstein says, adding that they aim to keep sym-

bols consistent across projects. Scale is also less important than it would be in a traditional map, she says. A ticket machine might be about the same size as a staircase - because all the symbols are designed to fit on a fingertip. "We want to use symbols that aren't bigger than that because that makes it harder to read. Smaller," she adds, "and it's harder to discern differences."

Then it came time to test the skills of workshop participants, with a five-page booklet that said "Do not open. NO PEEKING!" printed across the top. Eyes scrunched shut, we sat at round tables, first trying to distinguish basic shapes before moving on to a simplified tactile street map. After failing to successfully identify all but the most basic shapes, and mistaking a staircase for a taxi stand, your correspondent felt a rush of appreciation for people who must rely on tactile maps.

"The blind and visually impaired don't just want empathy, they want practical solutions," Greg Kehret says. "By showing what's possible and making it available to as many people as possible, we're changing expectations around what is reasonable accommodation, really raising the bar above and beyond."

References:

1 **TMAPS** maps are available online at http://lighthouse-sf.org/tmap/
Along with three versions of the map (simple, moderate and dense map scale) buyers get a tactile map key and an intro duction to using tactile maps.

2 **MAD Lab**: http://lighthouse-sf.org/braille-and-accessible-design/

3 **Sources for stats**: http://www.afb.org/info/blindness- statistics/2
http://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment

FAV MAP, continued from page 21

After the good earth had its say, Spanish Catalans settled in and civilized the island with all the trappings of government. Well, they did their best in that regard. The French had something to say about control of the Naples coast, and that included Ischia.

When the French weren't laying siege to the island, several decades before Ortelius first published his famous atlas with map, the Barbary Pirates operating in the region were terrorizing the islanders in their own inimitable pillaging way, and many of the inhabitants ended up as slaves to the pirates. If you have ever heard of a pirate named Barbarossa, here is the true-life connection.

Ortelius reflected the turmoil of the time by engraving several fire-spouting galleons, rushing quickly by the island (toward the bottom of the map). Curiously, Willem Blaeu, with his own version of the map, changed the passing vessels to placid Venetian galleys.

All in all, the map detail is fascinating (like any Braun and Hogenberg Renaissance city view), changing a little with the imprint of each map maker. I keep an eye out for successive versions of *Ischia Isola, olim Aenaria*. Let me know if you find one that I haven't seen.

SAVE THE DATE!

SPRING MEETING,
APRIL 13, 2019
DAVID RUMSEY
MAP CENTER,
STANFORD, UNIVERSITY

◀ High resolution presentation screen, 16' x 9'

Bay Area Map Group Meeting

Hosted by Juliet & Leonard Rothman

On Saturday, July 21st, 21 members and guests of the Bay Area Map Group met for an afternoon focused on everyone's major interest: maps and mapping. The group welcomed several new and almost-new members, as well as family members and guests of members. Spirited and interesting conversations and snacks were followed by a session of sharing an area of interest related to maps and mapping. Every member had brought something special to share, and member followed member in presentations.

As the host, **Leonard Rothman** began the presentations, sharing some of the special globes in his collection. He showed the group the globes he had written about in previous issues of *Calafia*, the 1838 Cary globe, and the first globe designed by a woman, the 1879 Fitz globe, as well as the globe which would be the subject of an article in this issue. He showed two Hammond matched globes from the 1920's and 1930's, a facsimile of the pre-Colombian Behaim globe of 1492, with vacant oceans where the American continents should be placed, an early 19th century Joslin globe, a 1913 school globe by Weber-Costello, a French 19th century globe by Forest, and others. He shared the story of his 1838 Cary globe—how some household ammonia that he was using to clean the brass meridian dripped onto the globe itself, and dissolved the darkened shellac which covered the entire sphere, revealing the globe map in excellent condition. He has developed globe-cleaning to an art which can be used on other globes as well, and shared his process with the group.

The Fitz Globe

Nick Kanas' Zodiac map is carefully designed and beautifully colored and framed. He shared that Barry Ruderman, who owned the map, had reached out to Nick for assistance in gathering information about it. The circular map is centered on the ecliptic, rather than on the pole. The needed information took some careful digging, as well as analysis, to locate, but Nick was finally able to trace the map to a French artist, Augustin Royer, who lived in the time of Louis IV, and to date it at 1679. The map contains a gold-colored rhomboid near the center—a clue which confirmed Nick's research, as Royes had himself invented the rhombus. He liked the map so much he then purchased it from Barry.

George Piness bought a simply beautiful little map of the Bosphorus while on a visit to Turkey. He and Edith had gone there to attend a map meeting, which also hosted two map dealers. The map is painted in shades of gold and blue, and both the shades and the images depicted shift and change with lighting and angle. George and Edith enjoy the map very much, and have moved it around in their home to view all the various shades and images. And—this map was a bargain at $28!

Map of the Bosphorus

Mary Holder found an old map in the process of sorting through family memorabilia. Her grandfather had lived in the city of Elmira, New York. Her highway map, dated 1964 but updated in 1971, is of Chemung County, NY— the county in

which Elmira is located. Mary pointed "right there"—to where her grandfather's home had been.

Richard Breiman brought a 1708 map from the Solarius atlas of the Southern Hemisphere, which was printed in Amsterdam by Jansonius. Although Solarius was German, he had moved to Holland to work—as an astronomer, as a mathematician, and as a teacher. Solarius' atlas, Richard shared, depicts and explains the theories of Ptolemy, Copernicus, and Tycho Brahe. It begins with a geocentric model, which showed the planets on a surrounding crystal sphere around the earth. The map shows the course of the sun around the earth, as described by Petrus Plancius, and includes the Peacock constellation, which is now no longer known. This beautiful map is highlighted in gold. **Barbara Keck** brought a Rand McNally DISTO-O-MAP, "A New Concept in Travel Planning," as a gift for Leonard. It illustrates multiple routes between points on a map. The United States is divided into 5 districts, with wheels that can be adjusted to find the distance between any two points.

Maryanne Hinckle brought a folded map of "Shakespeare's Britain," a map originally produced in 1964 by National Geographic. The map had red flags to indicate the locations of all of Shakespeare's plays! Most seemed to be centered in southern England locations, but there were many others as well. Looking at all the little red flags, and reading the names of the plays on them certainly made one aware of how very prolific the Bard really was.

Shakespeare's Britain

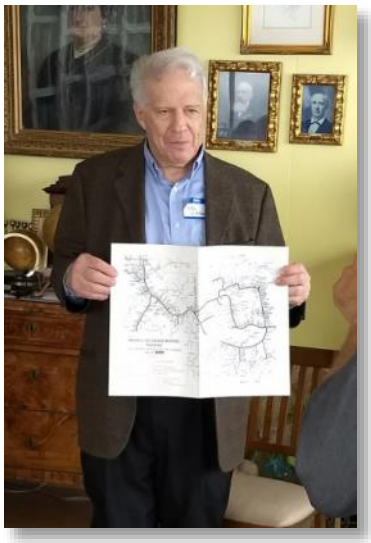
Wally Jansen held up two white squares to show his maps. When everyone had stared at them in confusion for a minute, he explained that these were actually Braille maps, one of Oakland and one of New Orleans. The maps can be used by people with visual impairments to locate specific routes and places, as well as to have a general "feel" for the surrounding areas. Raised spots on the maps could be traced with fingers. Wally passed the maps around, and it was interesting to note the grid-like pattern which indicates Oakland's layout. He then shared another very interesting map—a map of Idaho's nuclear plants. The map was created as a part of a project with which Wally was engaged: to "crash" the plants, and then to explore what remained. As members jokingly teased about radioactivity and glowing, Wally went on to explain that the project's goal involved scanning material with an electron microscope, so that the modified composition of the alloys used to clad the fuel could be better understood.

National Geographic was central to **Steve Hicks**' presentation as well. He shared images by N.C. Wyeth, who had been hired by National Geographic to paint murals in the headquarters building in Washington DC. The murals included two global hemisphere maps. Everyone was surprised to learn that copies of these hemisphere maps can be ordered on—yes—Amazon! These reproductions have adhesive backing so that they can be applied to walls.

Ken Habeeb shared a map of California in 1855, at the height of the Gold Rush, by J.H. Colton. He pointed out that many place names had changed, such as "Redwood", now known as Redwood City, "Sacramento City", now known as Sacramento, and "Calusi", now known as Colusi, while others towns had disappeared altogether, such as Alvarado, Gibson, Eureka (in Plumas County), and Munroville, now a ghost town. It was especially interesting to learn about the town of Cherokee, located above Nevada City, an area that had been settled by Native American tribes for thousands of years. The Cherokee moved in—and discovered gold! In its heyday, Cherokee had saloons, shops, and even a physician-owned drug store.


California during the Gold Rush

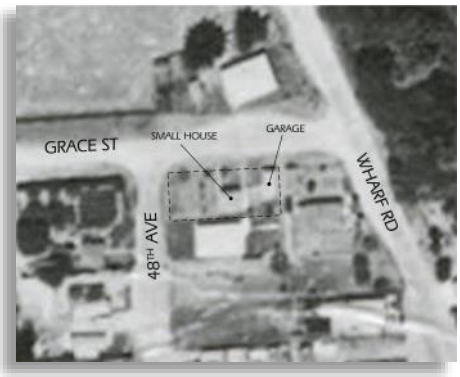
Noel Kirshenbaum showed the group an unusual map—a coal mines railroad map of Utah, Colorado, and Wyoming. Delicate tributary lines indicated the links between the individual coal mines and the main railroad line, which linked the Pacific region and the East coast. Three very interested members shared their thoughts: Wally Jensen said that the railroad lines today run on the very same tracks as


Coal mine railroad map

those defined on Noel's map, as coal trains and passenger trains share tracks. (He hinted that coal trains had priority—passenger trains had to wait while coal trains passed through!—and that this very track is today's Amtrak). Leonard Rothman pointed out that the very first commercial railroad in the United States was built in his hometown of Quincy, MA in 1826, to carry granite from Quincy's quarries to buildings in Boston, and Carolyn Kanas shared that, as a native Pennsylvanian, she knew all about the coal mines in her own state, but wasn't as familiar with those out West.

A fascinating map, really a proposal, for the building of a bridge across the San Francisco Bay was shown by **Fred Auda**. An early proposal, this map illustrated a potential Bay Bridge for a railroad, the "last link" in the Great Central Pacific Rail Line. Drawn and printed by LR Townsend in 1871, the proposed bridge, at a height of 12 feet, would include 4 railroad tracks, a "carriage road", 2 "city horse tracks", and 2 "pedestrian zones". Time to completion: 3 years! Fred shared two other interesting ideas as well: the concept of olefactory maps, a thought he had based on the outdoors routes of his blind dog, who travels the neighborhood unhindered and aware of his surroundings, and a map he had made of the shadow of his wife, as they traveled south to north in December of 1972. He drew her shadow in 9 locations, from 7 degrees south to 30 degrees north, through La Paz, Cusco, Guatemala City, Mexico City and others, finally in San Francisco. The length of the shadow grew ever greater as they traveled north, tracing the declination of the earth at that time of the year.

Fred DeJarlais took the group on a fascinating journey – through the various ways in which property and property ownership is defined by different areas of government and public utilities. One would think there would be consistency between these agencies—but—not so! In 2013-2014, Fred and his wife built a new home in Capitola. He showed a plat of the area, with lots all defined clearly, and numbered. His lot was #22. A 1954 USGS survey map indicates what had been on the lot. It does not indicate any structure, although in fact a small garage had been on the property at that time. The aerial photo archives of UC Santa Cruz indicate a garage, but also, through light and shadow, the outline of a home is shown. The County Assessor's office lists a small, 18'x20' dwelling, as well as a garage, as built in 1939, and demolished in 1957.

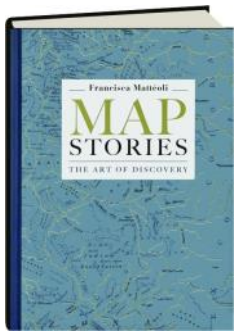


1956 Aerial photo—Capitola

School and drainage area fees are based on the buildings on a lot, and Fred was able to get these costs adjusted downward through his study of the area maps. In addition, an alley appears behind the lot, with no ownership identified on the original subdivision map. Fred was able to obtain quit-claim deeds giving him ownership of one-half the alley behind his lot and giving his wife extra space for her garden. Such is a lesson in the applicability of map awareness!

The enthusiastic group agreed to meet again in the fall at a date to be determined. Barbara Keck has graciously volunteered to be the hostess.

Book Review



Map Stories, The Art of Discovery, Francisca Matteoli, ILEX Division of Octopus Publishing, London, 2016, ISBN 978-1-78157-377-8, 173 pages, maps, coffee table format, Amazon priced less than $21.

Reviewed by Bill Warren

Do you remember Richard Halliburton? He was an adventure-travel writer who produced a series of books like *The Royal Road to Romance,* mostly written for young readers. He catalogued his adventures in doing things like swimming the Panama Canal (his toll, 38 cents) and sneaking into the Taj Mahal to spend the night alone. His florid writing style thrilled sub-teenagers, till we learned that he met his end in 1939 trying to sail a Chinese junk across the Pacific Ocean to California.

Francisca Matteoli is the product of a Scottish mother and a Chilean father. She grew up in South America and the world, finally settling in Paris' 1st Arrondissement, a stone's throw from the Louvre. She has written a number of books taking up where Halliburton left off but concentrating on hotels around the world. She got interested in maps and particularly maps having to do with early exploration. This book is the somewhat uneven result of that interest.

One of the problems is that the book designer wanted to use "pretty" maps, rather than relevant maps, so there is often a disconnect. I suggest reading chapters of this book near a computer and filling in the story by checking relevant websites. The book will whet your appetite for more information.

Petra is in Syria. That fact is not mentioned in the chapter about J.L. Burkhardt's 1812 travel there, disguised as an Arab. He sacrificed his goat and rapidly decamped to reveal Petra's story to the Western World. Nor do the two maps accompanying the article, Ramusio, 1540, and Sanson's 1654 *Carte de Trois Arabies,* indicate its location. But they are rather nicely printed in, obviously not original, color.

I wasn't familiar with the discovery of Angkor Wat in Cambodia, originally built in the 12th century as a Hindu temple, perhaps the largest such temple in the world. It was then gradually converted to Buddhism, although the often sexually explicit sculptures survived that change. In this case, one of the maps is a nicely printed 1932 map of the complex and surrounding territory. Matteoli's text describes how Henri Mouhot made pencil sketches describing the vast temples in 1858.

Not all of the chapters describe exploration. Route 66 through our own Southwest forms an interesting tale of how locals promoted the highway from Chicago to LA. Famous in song and story, the road survived the Great Depression but couldn't survive President Eisenhower's decision to develop the Interstate Highway System. Route 66 still exists in the background and history buffs still seek out the iconic signs in Oatman and Monrovia to prove it's still there.

The 2181-mile Appalachian Trail stretches from Georgia to Mount Katahdin in Maine. So, it is illustrated by an 1890 Linguistic Map of American Indians and an unattributed map of British Colonies and Northern New France in 1750-1760. Hmmm? The Appalachian Trail was originally conceived in the mind of Connecticut forester Benton McKaye in 1921. An estimated 12,000 people have hiked the entire length since 1937. In 2016, 1,200 plus completed the north-bound trek. The best description of hiking it in pieces is Bill Bryson's *A Walk in the Woods.*

In 1930, the French were looking for ways to get their names on the map, and enthusiastically adopted a proposal of André Citröen to drive his company's vehicles from Paris to Beijing (then called Peking.) The Russians told him he was nuts and suggested that they go through Afganistan and India, instead of Russia. Great idea. They ended up breaking the heavy vehicles into 66-pound pieces that mules could carry across the mountains, reassembled them and finally drove into Peking like nothing had happened.
Loch Ness, Madagascar, Machu Picchu, The Orient Express, all are pieces of the story the author bounces through.

OK, so forget about a non-map person having written this map book. There are some nicely written stories of interesting exploration and discovery written in a format of semi-florid fiction. It's not written as a scholarly work; just sit back and enjoy the short chapters and colorful maps. Then see what Wikipedia or Condé Nast Traveler has to offer, to fill in some of the blanks. And remember, it cost just a little more than $20 for a nice coffee table map book.

Building Worlds for Data

RJ Andrews

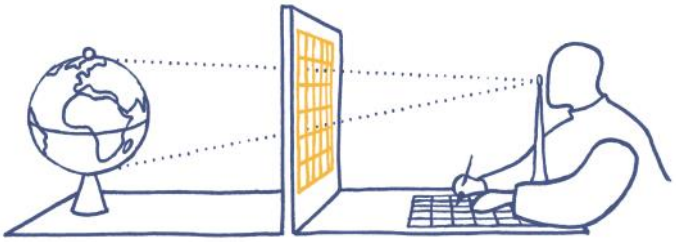
RJ Andrews is a "data storyteller." His latest book, Info We Trust: How to Inspire the World with Data, is going to publication with Wiley. It is a lavishly illustrated adventure through the ways that maps and mapping can be used to discover and inform. RJ shares with us an abbreviated version of one of his chapters here.

Think of the number line as a virtual world. Compared to the world we inhabit, it is rather simple. Yet, the number line is a self-contained world. It has order, rules, and constraints. Like a tabletop aquarium, any number line is a product of and exists within *our* world. Both the number line and aquarium are also distinct domains we get to play in. When we invoke visual metaphors to visualize data, it is like we are imagining a fish tank for the data to swim in. How big should it be? What does its terrain look like? Will the data look interesting in this world?

Our original look at the world is with our own eyes. They give a thoroughly unique perspective. From our self-centered vantage, we perceive direction and distance relative to our body. Things are to the right or left of me, below or above me, close-to or far-away-from me.

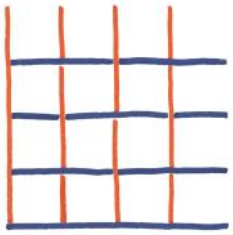
Even though we are vertically-oriented creatures, our motion is often abstracted to a flat, 2-D world. We live in a world represented by the marriage of two number lines: forward-back and left-right. Most of our spaces are flat because it takes a lot of energy to raise our bodies against the force of gravity. The vertical dimension is only seriously considered during specific activities. We think about going up and down when we scale a hill, ride an elevator, or climb to cruising altitude. Despite our higher dimensionality, we frequently think about our own physical reality as a kind of Flatland.

Imagine walking across the neighborhood to dinner. Part of your mental vision might include some kind of avatar moving about an overhead map. Mobile web maps reinforce this view. They dynamically reposition the entire virtual Earth so that you stay at the



center of the screen. You are the star of the show. This out-of-body perspective fuses our personal vantage with a more objective frame of reference.

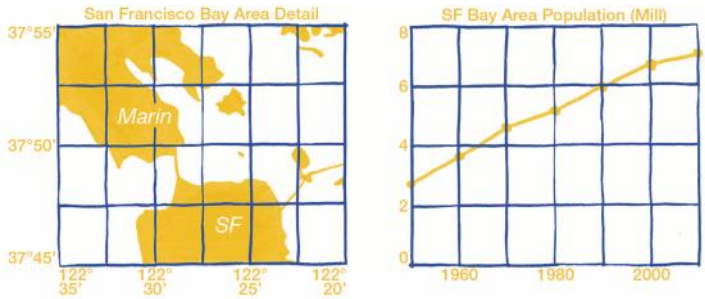
The front-back-left-right vantage is meaningful only to the unique viewer. In contrast, a north-south-east-west grid is useful to anyone who traverses its plane. Latitude-longitude's objectivity transports our personal experience from relativity to the 2-D virtual world. In either case, how we think about our multi-dimensional world is not so multi-dimensional after all.



The perpendicular number lines of longitude and latitude mimic the physical world. They connect physical geography to the Cartesian plane. The geographic map is a gateway to exploring an endless variety of 2-D virtual worlds. Replace the longitude-latitude axes with other dimensions, such as time and performance, and the same grid can be used to explore more abstract territories. A familiar grid variant places time on the horizontal axis. This abstract grid shows us what would be difficult to appreciate otherwise. It lets us see how a value, like population, changes over the years, in a way impossible without a picture. All grids are virtual worlds we interpret and navigate.

When you define the horizontal (x) and vertical (y) axes of a 2-D plane you are world-building. Virtual environments are invoked so data can be positioned. Just as map roads and buildings demand a virtual geography, all data must have a spatial home if they are to be seen. It is like a set-design for play actors. The show cannot go on without a stage. Some of these environments, like the stock market price (y) over time (x), are quite familiar. Other worlds require careful introduction. Most of these virtual worlds will build somehow on our familiarity with the number line and its conceptual extension, the timeline.

Like 2-D web maps, data worlds are not reality. They are useful virtual models of reality. It is easy to lose yourself in these virtual worlds, but we have not yet been completely consumed



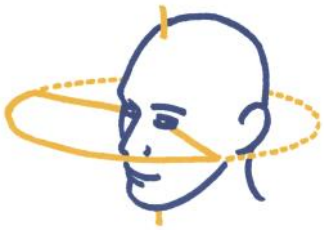
by them. We still look toward the horizon and picture what is on the other side of the next hill.

Geographic maps and Cartesian x-y charts are everywhere. However, perpendicular axes are only one way to build worlds for data. Polar coordinates put the focus of the world on a central axis, or pole, and extend vectors away from that anchor. The polar world has two dimensions, just like its Cartesian cousin. But their meaning is asymmetrical compared to the rectangular grid. Cartesian axes are balanced in rectangular harmony. Polar coordinates' nested circles and radiating rays are not so interchangeable. They strike a different kind of perpendicularity. Each polar axis has a differentiated ability to convey information.

Vectors are perfectly shown with the angle-magnitude dimensions of polar coordinates, but these axes can do even more. Polar charts reflect basic ways we perceive the world. They channel an outlook from a definite perspective and they reflect our cyclical appreciation of time. Further, polar charts often have a compact form factor, which makes them efficient partners to many compositions.

The pie chart shows part-to-whole ratios. It works well for a few categories. All things being equal, data is usually better displayed with a bar chart, but things are often not equal. Pie charts continue to perform on thematic maps. There, they serve triple duty: encode position as marks on a greater reference plane, encode magnitude with circle area size, and encode a simple ratio with the angular division of the pie.

Polar coordinates make virtual a world-view that appreciates distance from the center. The tribal, and *polarizing*, us-versus-them attitude reflects a past reality where we did not yet have a global sense of geography. In some ways, the self-centeredness of polar coordinates is more natural. We stand upright at the center of our own personal world and turn about to look out at what is near and far. In the evolutionary extreme, polar coordinates hurtle us right back to a life of jumping through the branches around the trunk of our home tree. Imagine an evolutionary ancestor's mental map of the world. The world is anchored to the safety of the tree. Distance is tracked from the tree. Direction is mapped around the tree, perhaps anchored by the position of the warming sun. The world extends cylindrically from the forest floor to the heavenly sky.



Much later, we lived in walled cities. The physical boundary protected the community from the dangers of wild animals and ravagers of the outside world. The early city, or *polis*, was safety. Its center was sacred, and often marked with a temple altar or vertical obelisk. For its inhabitants, their city was the center of their world. Unlike the ancient tree-jumpers, early city-dwellers were already losing interest in the vertical dimension. Our love of polar coordinates is more deeply rooted than we can imagine.

As we move about the globe, different perspectives help us enhance the environments we build for data. Cartesian and polar coordinates are ready encoding blueprints for positioning data. These virtual microcosms mirror physical environments. Their familiarity helps audiences navigate and interpret their way through information. The mental maps we already use to explore the physical world are repurposed to explore all kinds of data.

Cartesian and polar coordinates are easy. Easy to understand, and easy to implement. They ask you to simply snap data variable to axis, then sit back and relax as data pop into place. And that is wonderful, but also only a partial conception of how we can position data. What if these ready-made systems are not the best visual home for your data?

We carry around a lot of lived knowledge in our heads. Some of it is spatial. Our ability to traverse places that are familiar is naturally stored on a mental map. But onboard geographic knowledge is not what makes people special. Other animals, some with built-in magnetic systems, are superior wayfinders. Eels, shorebirds, bats, and even ants all navigate staggeringly immense journeys. [1]

What is truly special about humans is our ability to absorb, store, and transmit information that has little to do with geography. We are obsessed with invisible abstraction. Long historical arcs of power. Personal and professional relationships. Emotions whose essence escapes numerical capture. The abstract worlds we inhabit are what make people marvelous. We have a choice. Should we ground abstract information in maps that stem from the geographic world? Both Cartesian and polar systems help ground abstraction, for creators and readers. But perhaps there is a better way to show invisible worlds. What other microcosms might surpass these encoding systems?

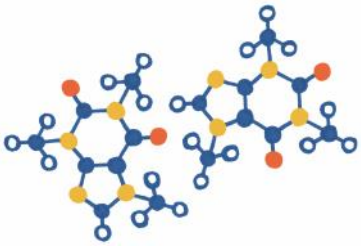
Vertical power relationships have persisted through thousands of years of history. From Egyptian pharaohs, to the Medieval Church, to today's CEO, we understand that power is stacked. We can see vertical power's origin with a vision of a predator above its kill. *The powerful are on top*. This visual metaphor is reflected in the design of the pyramids, and org chart. Today, our conception of hierarchy is divorced from lived physical reality. Vertical power encoding logic is rooted in how we imagine the power dynamics of society.

Information always invites us to realize it into better forms. It does not always map well to any standard linear or circular dia-

gram. Perhaps your mind pictures it in a different way, just as the corporation is reflected in the tapered shape of the pyramid. Take a moment to pause and engage with your mind's eye. *How does my mind already picture this information? If I were to paint a picture of what my mind already sees, what would it look like?*

Data that do not map to familiar spatial encodings often have something to do with relationships. Relationships are documented by their nodes and whether these nodes link to one another. Then, qualities about the nodes and relationships can be added. Node-link network graphs reflect this particular data structure well. But like a table of text, these graphs often come up short showing anything of interest.

Network positions are fluid. If you remake a network graph, then nodes may appear in a new location, as long as the same relationships are kept. This is different from the geographic map, where the same city will always appear at the same latitude and longitude. You may never see the same network the same way twice. Caffeine is still caffeine, wherever the nodes get drawn.



This freedom of positioning can be problematic. We yearn to catalog, categorize, and fix things in space. Consistent positioning gives us something familiar to compare new things against. Unreliable, always-changing network positions take away the opportunity for a spatial baseline reference. Changing positions reduces our ability to visually compare the new to the familiar.

The spatial freedom of network graphs also runs against how our mind actually pictures relationships. The mind may not see networks as tied to any geography, or even numeric scheme. The mind may also not be able to picture many relationships at once. But, the mind's way of thinking about relationships often has some kind of meaningful order. Your high school friends do not switch mental cubby holes, back and forth, with your family members. You anchor classes of relationships according to some kind of schema. Just as power relationships were likened to physical domination that put the subjugated below the powerful, conceptual rules can be unearthed to help position network graphs. Positional logic boosts context and helps keep design consistent for later reference. The chaos of the ever-morphing network graph can be reined in if we build it a more meaningful world.

Outward facing polar diagrams. Number lines. Geographic maps. Timelines. Network graphs. They all began with how we understand our own physical reality, and then advanced toward abstract visions of invisible worlds. We have a sense that these perspectives can help us build better worlds for data. Better worlds fit how we already think about things so that it is easier to learn something new. But world building is not the end-game. We build worlds so that we have a place to layer meaning. We build worlds so that we can see data.

More of the author's stories can be accessed at www.infowetrust.com. His book, Info We Trust: How to Inspire the World with Data, is now available at Amazon.com

Maps for the People by the People – Participatory Mapping

Timothy Norris, PhD

For most of cartographic history, maps have been made by those who had the technical knowledge and skills to construct the geographic representation of the earth's surface. Generally, these cartographers were in the service of the state, or were individuals with power. The subsequent use of the maps most often reinforced power relations between rulers and the ruled. Yet over the course of the last several decades, participatory mapping (PM) and public/participation GIS (P/PGIS) have emerged as alternative processes to this historical status quo. Local people who reside "in the map" are included in the collection, analysis, sharing, and visualization of geospatial data, with the goal of making GIS and cartographic practice more inclusive and democratic. Indeed, recent technological advances in global positioning systems (GPS), computerized geographic information systems (GIS) and the world wide web (WWW) have forever altered the cartographic process that spans data collection, graphic representation, and map interpretation.

The origins of participatory mapping as a cartographic field method are generally traced to Hugh Brody's work with several native American tribes and land occupancy mapping in British Columbia (Brody 1982), to Harold Conklin's work in the Ifuago province of the Philippines (Conklin 1980), and to Robert Chamber's development work in Africa (Chambers 1994). These early efforts are often linked to "action research" – research that is designed to foment societal change. For example, Brody's work, while part of a broad anthropological study of the Athapaskan Indians of British Colombia, clearly shows the cultural and environmental impacts of the slated Alaska Pipeline that would cut through the indigenous territory in question (see figure 1). Another clear example of geographical action-based research linked to participatory mapping comes from William Bunge's work in the 1960s with African-American neighborhoods in Detroit (see Figure 2). These maps were made to tell alternative stories: stories of people who do not often have a voice in the cartographic process.

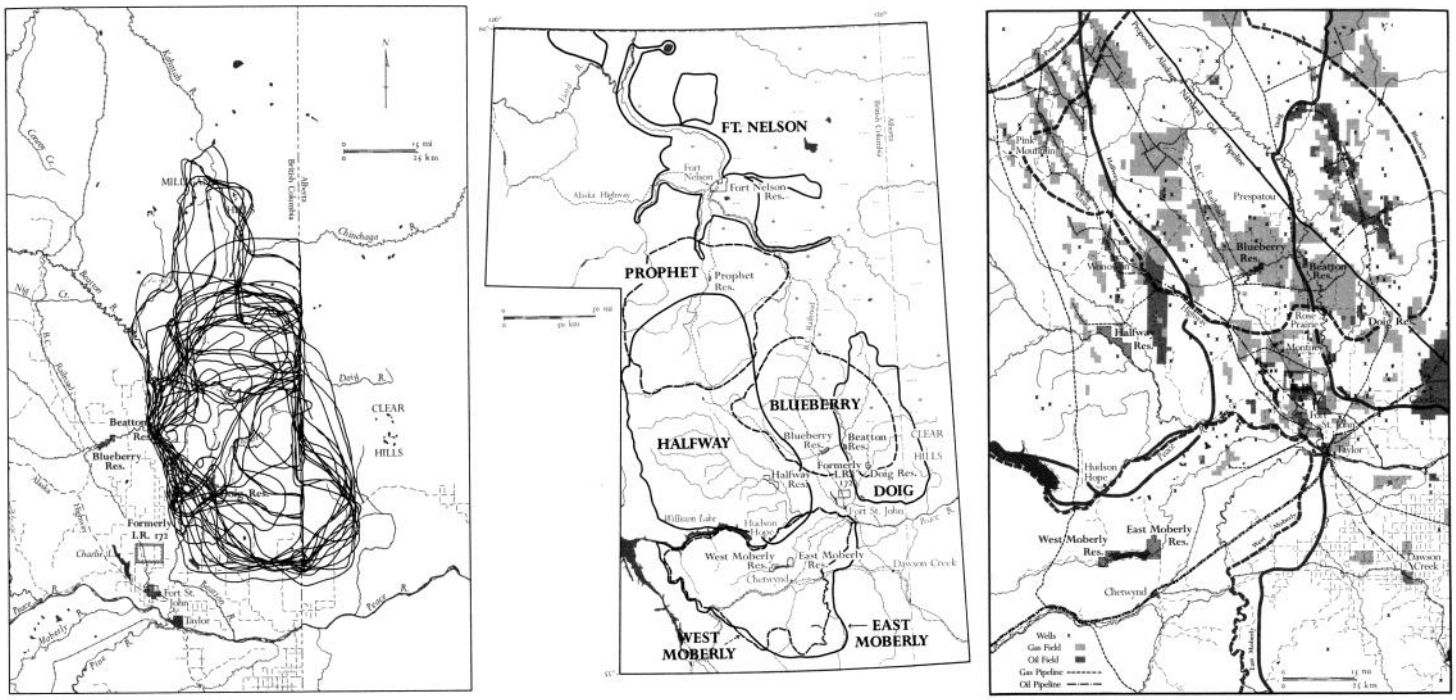


Figure 1: *From left to right: Hunting grounds of the Doig River Reserve, Hunting Territories in Northeastern British Colombia, and Oil and Gas (Brody 1982, 161, 173, 243). This series of maps tells a clear story of how conflicting visions of land use and development will impact the cultural and environmental landscape.*

This historical characterization may be misleading, as cartographic enterprises such as King Philip II of Spain's 16th century *Relaciones Geográficas* can also be considered participatory—they too relied on local indigenous cartographers to render geographic knowledge on paper. Indigenous artists effectively participated in Spain's cartographic project, while

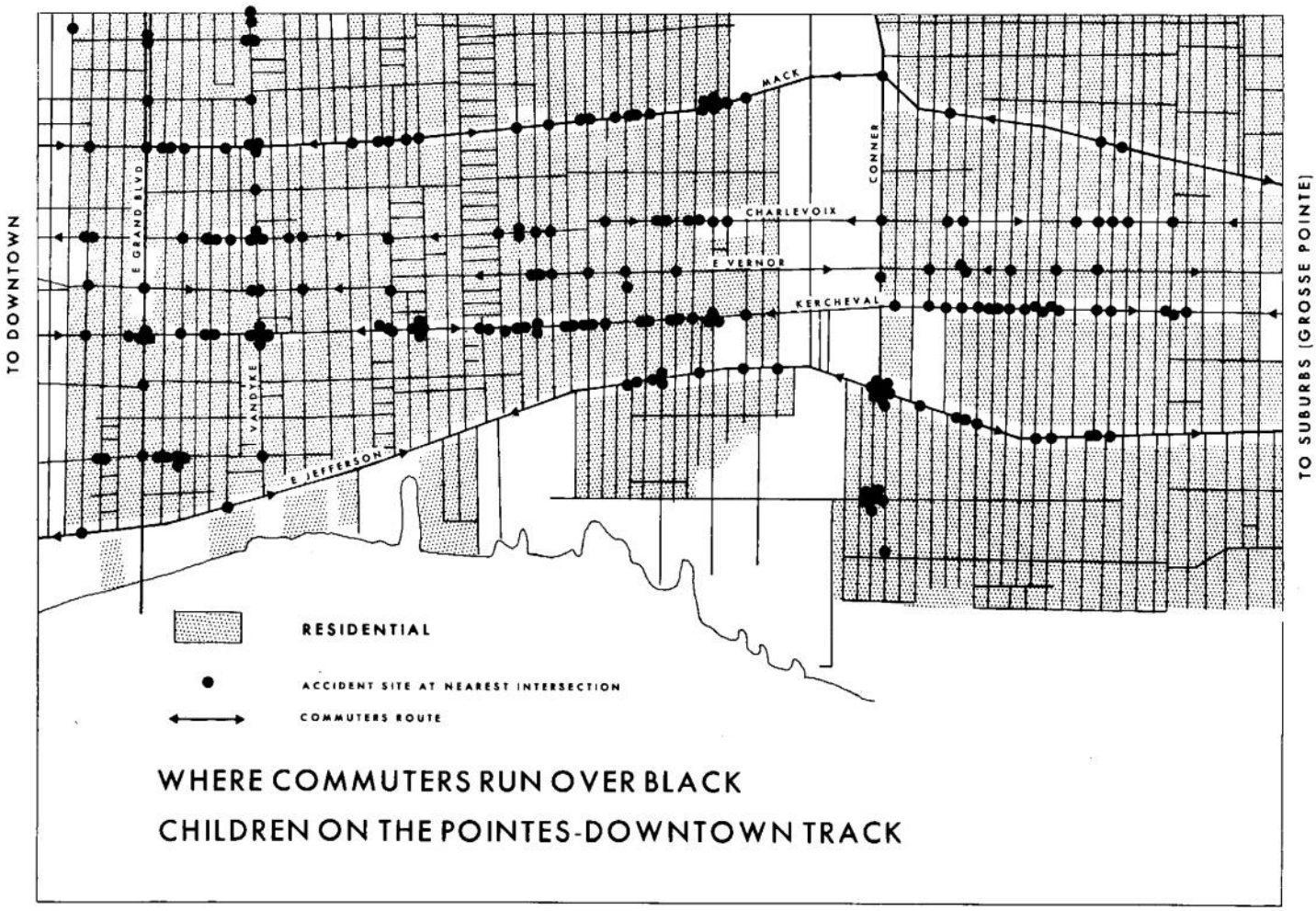


Figure 2: *Map from the Detroit Expeditions organized by Bill Bunge in the late 1960s (Colvard 1971, 18)*

at the same time making subtle claims counter to those of the Spanish Empire. This is clearly seen in the Cempoala map drawn by Nahuatl artists in 1580, which shows a landscape full of local indigenous leaders and reflects a standing tradition in mapmaking that predates the Spanish conquest. The map is a powerful statement that the Nahuatl people were in the New World long before the Spanish arrived (see Figure 3).

No matter the chosen historical point of origin for participatory mapping, any effort to create a map with local people relies on two fundamental assumptions: (1) maps drawn by local people are more accurate and useful than maps compiled by outside cartographers, and (2) participatory mapping empowers local communities. It is likely that the first assumption is true; and that local knowledge is more accurate, especially for toponyms. In terms of the second assumption, several decades of on-the-ground work shows that participatory mapping can give voice to marginalized populations, empower them, and

Figure 3: *The Cempoala [Zempoala, Mexico] map drawn by Nahuatl artists in 1580. Benson Latin American Collection - University of Texas at Austin (Nahuatl artist 1580)*

facilitate indigenous self-determination in a variety of political, economic, and social settings (for example, Smith 2005). Often these success stories are centered on the role that the maps play in re-territorializing colonial spaces through the drawing of group-based ownership boundaries and the claims that these lines make about ancestral rights and indigenous control over land and resources (see Figures 4 and 5). In a certain sense, they celebrate the inevitable assimilation of non-capitalistic societies into a mode of social organization based on institutional crea-

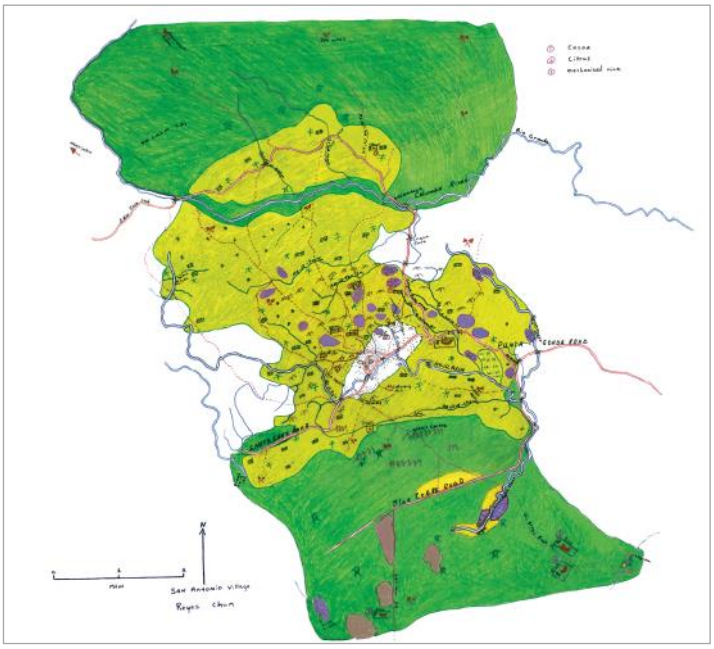


Figure 4: *Hand drawn land use map of a Maya village in southern Belize (Toledo Maya Cultural Council 1997, 45)*

tion and protection of private property. Whether this process empowers is highly contextual and not yet proven by all experience.

Indeed, some work shows that participatory mapping is neither empowering, nor a panacea for resolving social, environmental or territorial problems (for example, Orlove 1991). Apart from the difficulties of measuring empowerment, ethical questions arise as to who is empowered: who wins, and who loses through the participatory mapping process? Some suggest that the cultural divides between those that make maps and those that make participatory maps are so great that the participants' ways of knowing cannot be correctly represented through cartographic practice (Rundstrom, 1995). Other relevant findings include how attention to gender, class, and personal security exacerbates community tension, and that top-down vs. bottom-up research design can significantly affect mapping outcomes. Nevertheless, these experiences do not deny that participatory mapping can be empowering. It is just that in some cases, participatory processes can go wrong.

> "More indigenous territory has been claimed by maps than by guns. This assertion has its corollary: more indigenous territory can be reclaimed and defended by maps than by guns. Whereas maps, like guns, must be accurate, they have the additional advantages that they are inexpensive, don't require a permit, can be openly carried and used ..." (Nietschmann, 1995, 5)

The above described participatory mapping experiences span the last several decades, and generally addresses resource conflicts, land-tenure issues, and conservation dilemmas in rural environments of the global south (with Bunge's work in Detroit as an early exception). Recent work brings participatory mapping back to the urban environment through public participatory GIS (P/PGIS) (Dunn, 2007) and what has been termed social cartography. Similar to the participatory mapping described above, P/PGIS and social cartography emphasize mapping as a means rather than an end. The map-making process empowers those who participate. Distinct from state-led cartographic efforts, through social cartography anyone can create a story on top of existing base data, thus enabling community organizations with limited resources to leverage the power of maps and find voice (Wood 2010). This type of

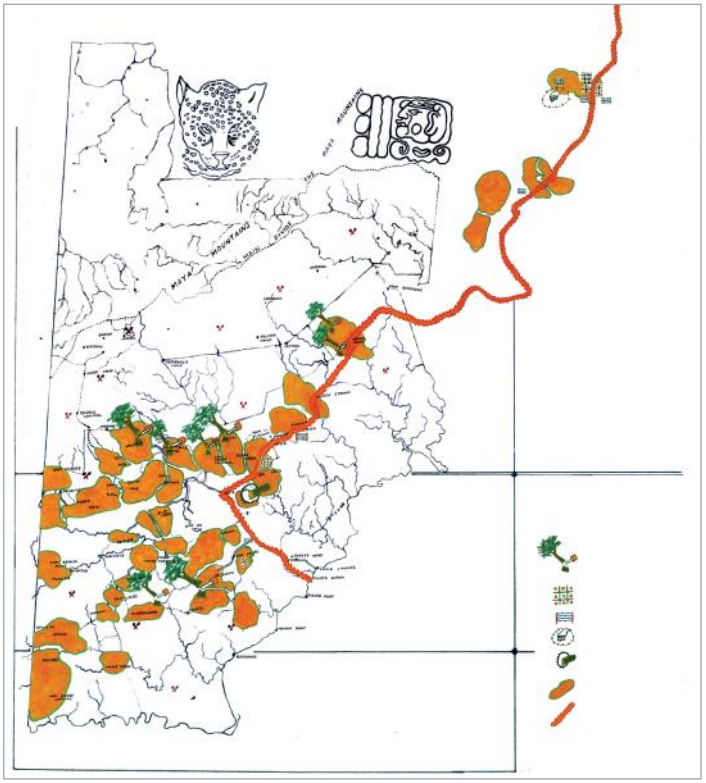


Figure 5: *Mosaic of Maya land use in Southern Belize. This map is constructed with local knowledge to demarcate ancestral claims to territory in Southern Belize (Toledo Maya Cultural Council 1997, 127)*

Figure 6: Community leaders in the Las Flores of Barranquilla Columbia map themes such as environmental and personal security in their informal settlement (aka slum)

process also emphasizes maps as performance, and shows how maps perform to disrupt hegemonic stories and ultimately the power structures these stories support.

As internet use exploded through the turn of the 21st century, participatory mapmaking increased in popularity. The advent of Google Earth, and of online platforms, such as Open Street Map, have enabled anyone with an internet connection to become data source, cartographer, and map consumer simultaneously. While David Goodchild coined the term Volunteered Geographic Information (VGI) to describe the phenomenon of data provided by the common internet citizen (Goodchild 2007), others have characterized this type of data capture as Vulgar or Vernacular Geographic Information. Mapmaking is no longer an activity reserved for the few expert cartographers. Indeed, some suggest that cartography, understood as "the science of the princes" (professionals working for the powerful), is dead (Wood 2010). As Renee Sieber (2006) suggests, in the hands of the public, the technologies of cartography have the ability to advance (or diminish) principles of democracy and justice, as well as the agendas of those with little voice now more than ever.

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THE AIR WAYS GLOBE

Leonard A. Rothman, M.D., "The Globalist"

The ***Air Ways Globe***, one of my favorites, provides much detailed information, and room for speculation as well. I have enjoyed owning and studying it and using it as a teaching tool for the study of map globe dating. It was made by the Replogle Globe Company in Chicago, founded by Luther Replogle (1902-1981) in 1930. (Illustration 1)

1—Air Ways Globe with meridian and cradle

This 10-inch diameter globe is composed of 1/8 inch-plastic and is not illuminated. It is covered by 12 brightly colored paper gores, with clear political boundaries, and bright blue oceans. A black and white easily rotated time dial rests on the North Pole. There is a removable 120-degree meridian, with a scale for measuring flying time at 300 mph and miles, decorated with two small planes flying in opposite directions. The globe rests in a cradle mount of pressed cardboard, with 4 short legs. The circular top of the cradle includes descriptive information, including hours and miles, earth statistics, the "great circles" and their relationship to air routes, the atmosphere and where it is free of clouds for efficient flying, and the wind/weather system.

Multiple red lines throughout the globe indicate air routes. It is interesting to note that the density of these is much greater over the United States. The specific areas of greatest density appear to be New York, Chicago, Fairbanks, and Honolulu. Outside of the U.S., Rome, Cairo, and Manilla also have multiple routes, while others, such as Calcutta, are "proposed".

To digress, there are many ways to measure the diameter of a globe in order to utilize its information accurately.

(1) Each of the 12 gores is 2.625 inches wide at the equator, resulting in the globe's 31.45 (=31.5 inches) inch circumference at the equator. To determine the diameter from the circumference, we can use the standard formula: C=Pi x D, where C is the circumference, Pi is 3.1416 and D is the Diameter. Then, converting C=Pi x D to C/Pi=D, or 31.5/3.1416, we arrive at 10 inches in diameter, verifying the accuracy of the declaration on the cartouche, just south of Alaska, which states that this is a 10-inch standard globe.

(2) Of course, a faster and easier way is to use a soft (cloth or paper) tape measuring the circumference and then calculating C/Pi = D.

(3) The very quickest way is to use a large caliper, which, as an obstetrician and gynecologist, I have collected, and which was used for measuring pelvic diameters! (ca. early 19th to early 20th century) (Illustration 2)

(4) A really simple way to measure a globe's diameter, if you have only a straight edged ruler or yardstick (and if the globe can be easily removed from its meridian and base) is to tape a thumb tack (using nonpermanent sticking tape) to the equator, pressing the globe tack on to a straight line on a large sheet of paper, then rolling the globe equator along the straight line of the sheet of paper until the thumb tack again perforates the paper, and then measuring the distance between the perforations. As you can imagine by now, the possible techniques are endless in number.

The Air Ways globe has 2 information sites above the Arctic circle: (1) Directly above Alaska, in the Beaufort Sea, are the names and dates of the first 3 explorers to reach the North pole: Peary, by sled on April 6, 1909; Byrd, by plane on May 9, 1926; and Amundsen by airship on May 12,1926. (2) Greenland has information printed on its interior, stating that glacial ice covers the interior, and that the average elevation of the island is 720 feet. This can be confusing, because only 20% of the island is habitable around the periphery which begins at sea level. The highest peak, Mt. Gunnbjorn, rises to 12,139 feet (Merriam Webster). It is known that the mean average eleva-

tion of the ice cap is 7005 feet and that its thickness is between 2.2 and 1.9 miles and its bedrock is at or near sea level (en.wikipedia.org). (Illustration 3)

The only other areas on this globe where elevations are noted are for some named mountains. Mount Everest is recorded as 29,141 feet at its peak. This is an 1849 measurement, and is outdated. By 1938, the average of measurement was 29,002 ft. Everest is presently felt to be 29,029 ft. at snow ht. and 29,017 ft. at rock ht. (Gulatee, B. L.). Other mountains on the globe are noted with heights that would also need to be verified for accuracy.

Directly south of California is a large analemma, showing the perceived path of the declination of the sun across the sky. The Legend in the southern Pacific Ocean is directly below the analemma, and has identifying lines and marks for railroads, highways, canals, swamps, steamship routes, existing air routes, possible air routes, various city sizes, scale of miles, scale of the globe to size of the earth (1:42,000,000), and the Replogle Globe Copyright. Notably absent from the Legend is the white arrow, which is found multiple times in all the oceans, showing the direction of the currents, all of which are named. (Illustration 4)

Finally, on Antarctica, in Scott Land, directly south of the Legend, are printed the names of the first three explorers to have reached the South Pole: Amundsen by sled on Dec. 14, 1911; Scott by sled on Jan. 18, 1912; and Byrd by plane on Nov. 28,1929. (Illustration 5)

The equatorial band unfortunately hides the longitude degree markings in many areas. The International Dateline is noted at 180W long., from the North Pole to the South Pole. The Ecliptic (the apparent path of the sun as viewed from the sun) is recorded for each month. The *equinoctial colure*, (an astronomical term showing the meridian that passes through the celestial sphere), is noted where the International Date Line is crossed by the ecliptic. Greenwich 0 long. is identified as Greenwich Long.

Modern globes, perhaps to extend their marketability over time, are usually devoid of a printed date, which makes dating a globe a challenging exercise. This globe is no exception. A very careful chronological investigation can usually provide the answer, however. On this Air Ways globe, the partial meridian can be used for determining distance and flying time. This equatorial plate also states that flying times on the globe are based on 300 miles per hour. Tracing Douglas commercial and military aircraft, we find that the first airplane to achieve an average 300 mph speed was the DC-6 (or the equivalent Boeing 377 Stratoliner and Lockheed Constellation), produced

2—Measuring the globe diameter with an obstetrical caliper.

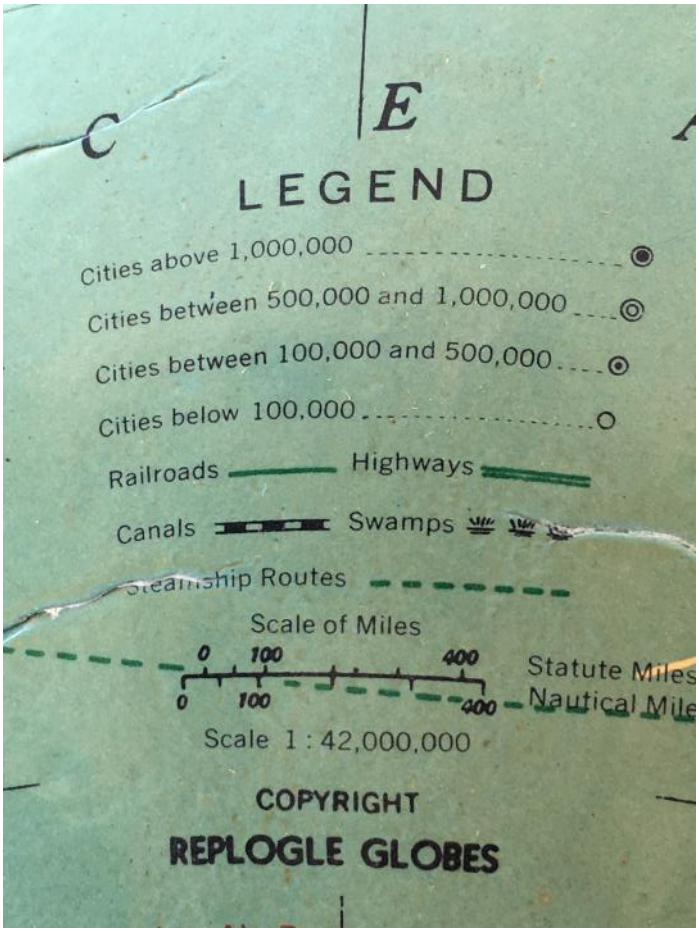
from 1948-1968. This tells us that the globe was probably manufactured sometime between 1948 and 1968.

3—Explorer listings above Alaska, rotating dial at North Pole, and Greenland ice cap information. Red lines indicate airway routes over the entire globe.

A further analysis, which would apply to most undated globes, would help to clarify the informational date (note that the actual globe construction could be then or at a later period).

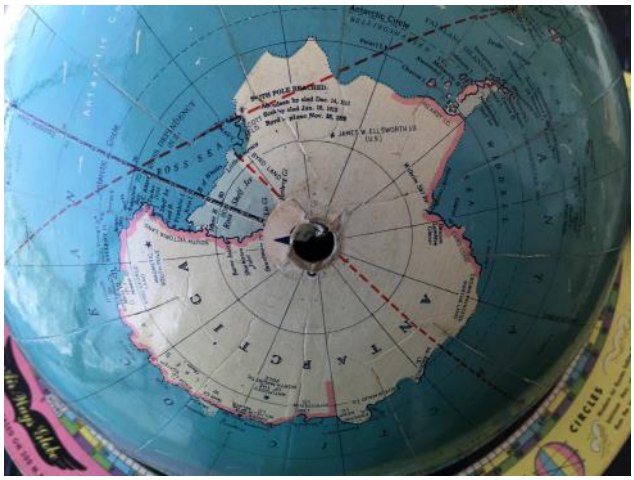
Generally, one would look at cities and countries for old names. For example, Constantinople became Istanbul in 1920; the area of North Asia was named Russia until 1922, the Soviet Union until 1991, and then Russia again; in 1945, Germany became East and West Germany, becoming Germany again in1990.

On the Air Ways globe, Myanmar is listed as Burma, a name the area assumed with independence from India in 1938. Geographical changes which occurred during 1940-1945, the WWII war years, are not noted. Transjordan, which became Jordan in 1946, is still listed as Transjordan. Pakistan, which became independent in 1947, is not mentioned, and is shown as part of India. The Philippines became independent in 1946, but are still listed as Philippine Islands, U.S. Israel, which became independent in 1948, is still listed as Palestine. Ceylon, renamed Sri Lanka in 1948, is still listed as Ceylon. (Illustrations 6 and 7)

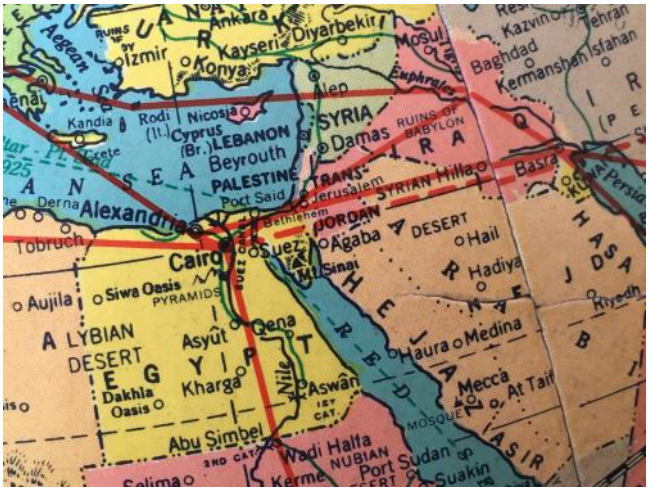


4—The legend appears in the South Pacific Ocean.

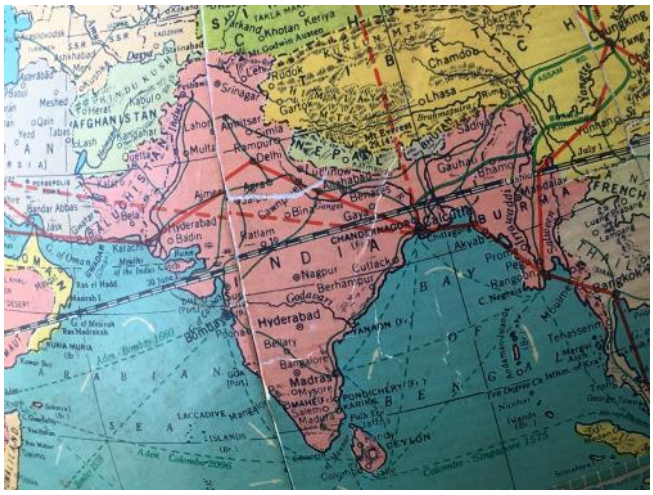
Thus, this very interesting Air Way Replogle globe, illustrating the 300-mph airline system of routes of 1948-1968 (clearly post-World War II) appears to be drawn on a globe whose political delineations appear as 1938-1946. In trying to further define the dates of construction and marketing, I contacted the Replogle Global company of Hillside, IL. They stated that they have no archival information related to this Replogle globe.



5—Explorer listings in Scott Land, and the known size of the Ross Iceshelf.



6—The Middle East, showing Palestine, prior to the State of Israel in 1948.



7—India, with Bangladesh and Pakistan absent.

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Looking Ahead:
Spring Edition of Calafia

Bringing back to life a very large scale model of San Francisco which was produced by the Works Progress Administration

Gray Brechin, Ph.D.
Project Scholar, The Living New Deal
Department of Geography
UC Berkeley

CMS Education Fund

The California Map Society Education Fund was established in 2014 by the Society with the goal of sponsoring an annual lecture by a noted author or other expert in the field of cartography. The lecture is held at the Rumsey Map Center at Stanford University, which co-sponsors the program. In addition, during the same week, the lecture is also held at venues both in Los Angeles and in San Diego. The fund provides transportation, accommodations, and an honorarium for the speaker. In addition, the fund will support a short-term fellowship in cartography at the Rumsey Map Center for a student from any university in the state of California.

The Education Fund Program, which sponsors noted speakers and students in their short-term fellowships, is currently funded for five years. The Society is considering a plan which will provide funding for this program for many more years. Education Fund programs are in addition to our regular semi-annual conferences in Northern and Southern California, which are supported by CMS general funds, as well as by registration fees. The semi-annual conferences also include student presentations, supported by prizes for the presenters generated from CMS general funds.

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The Society is grateful for their interest and support of this important program. Please consider adding your name to this very special list by making a donation to the Fund!

Meet Our Member

Michael Jennings, PhD

Owner, Neatline Antique Maps

San Francisco

Interview by Juliet Rothman

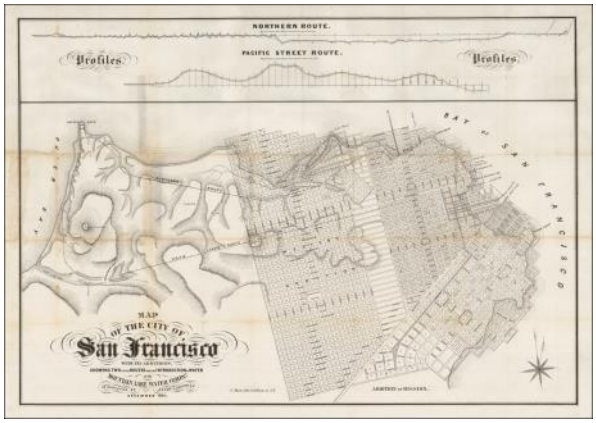
Michael Jennings is a native Californian, born and raised in Marin. He attended UCLA, majoring in political science, and then joined a team from Stanford on his first archeological dig—in the Alps, at a Roman and Celtic site. The team did not find many artifacts, but the experience inspired an interest in archeology. His studies, and the experience of the dig itself, made him aware of the way in which medieval history had tended to be taught and written from a Eurocentric perspective, with minor references to cultures and places where Islamic culture had flourished. He noticed, also, that periods of cultural flourishing tended to cycle through the years—at times, the Christian world flourished, at times, the Islamic world. Literature, science, the arts, and culture all seemed to follow these cycles.

After graduation, Michael "traveled the world", and then, having decided to focus his work on the area of Islamic archeology, he began graduate studies at the University of Chicago, one of the few universities—along with Oxford in England—which focused on Islamic culture as a subdivision of archeological studies. The University had a scholar in this area, with whom Michael worked on digs at sites in Sicily, which had had a flourishing Islamic culture until the time of the Norman conquest in the 800's. Many cities and towns in Sicily, still today, have the word "Calta" as a part of their names. "Calta", Michael shared, is the Islamic word for "castle.

His dissertation was focused on the area around Jericho and was a landscape study of the Jericho plain. To begin his study, he did what all archeologists must do at first: he consulted old maps of the area on which he was focusing. The area around Jericho at the time had undergone many changes, as modern populations moved in, building roads, structures, and other modern appurtenances, and disturbing the ancient sites. Michael used the Survey of Western Palestine, mapped by the British, which included sites that no longer existed, as well as flora and fauna of the area, and thus was able to locate ancient sites with them. Poring over these maps made him "fall in love" with maps, a love which continues today.

During his time in Sicily, Michael met another archeology student, who was from Ferrara, and had similar interests, and they had fallen in love. He married as he completed his dissertation and graduate work. The young couple faced some major decisions immediately: where to live, and what career path to follow. They decided to settle in the United States, to return to Michael's home in the Bay area, which they love, but to visit Italy often, and to raise their two sons with both Italian and English language skills.

Career decisions followed. Michael considered academia, but then decided to do something related to his love of maps: to open a map business, Neatline Antique Maps, in San Francisco. He loves all maps, especially those of San Francisco, and maps with "personal touches"; for example, he fell in love with an 1846 Mitchell map of the west, printed in Philadelphia. It had a note on the inside flap from a woman to one of her sisters, wishing her luck on her move West, for which the map had been a parting gift. He continues to expand his interests in maps and is still thinking of possible directions to explore. His wife also made career decisions and decided to become a map restorer. Michael says she was familiar with materials from her studies of archeology – ceramics, and glass – and paper seemed to be a natural part of this. They often work together: Michael purchases maps in need of repair, and she restores them!



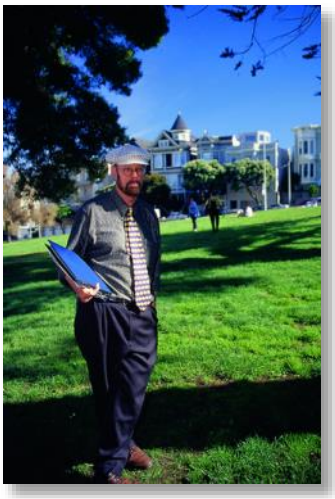
Map of the City of San Francisco with its additions, Showing Two of the Routes for the Introduction of Water by the Mountain Lake Water Company. As Surveyed By Henry S. Dexter C.E., December 1851

MAX KIRKEBERG

Professor Emeritus, San Francisco State University
San Francisco Photo Historian

Lavonne Jacobson

Since retirement, I've had the pleasure of volunteering once a week with someone who has devoted his life's work to documenting the streets of San Francisco. Although he is not creating actual maps, SF State Geographer Max Kirkeberg has captured urban change in San Francisco in images for more than 50 years—not always perfect photographs, but historically valuable views of several neighborhoods over time. The University is honoring his work by gradually scanning the more than 60,000 photographs and making them available on the Internet, organized by neighborhoods. Only about 20-25% of the collection has been scanned to date. The photos are available at Digital Information Virtual Archive (DIVA), an open digital collections archive, https://diva.sfsu.edu/browse/collections/collection-14 (Kirkeberg, M.).



Professor Kirkeberg, Alamo Square, San Francisco, 2003

Emeritus Professor Kirkeberg came to SF State in 1965 with an academic background in geography, political science and history; he retired from regular teaching in 2002. His Cultural Geography courses were always popular, and he is an engaging, authoritative, and lively lecturer. Everyone's favorite course, however, was "San Francisco on Foot" focused on various neighborhoods over time. Although now in his eighties, Kirkeberg still gives walking tours from time to time. The tours are informed by his extensive prior research on the architecture, history, businesses and cultural features of the neighborhoods, and by his special interest in the history of churches throughout the city. The campus alumni magazine, SF State Magazine, featured his walking tours in 2003. (Bee, A.)

As he taught and walked the city over time, Professor Kirkeberg came to identify the themes that resonate throughout his slides and integrated brief comments on each in his presentations: gentrification, ethnic succession, industrial abandonment or conversion, shifts in population demographics, the waterfront without a freeway; sociopolitical movements such as gay liberation and the hippie era were the most relevant aspects. Currently, images of the South of Market are in process and not yet up on the Internet, but they are clearly illustrating the most dramatic changes to date.

Professor Kirkeberg shares a love of and devotion to San Francisco with others who have created web sites such as *FoundSF* (http://www.foundsf.org) and *Open SF History* (http://opensfhistory.org). In recognition of his work, the San Francisco History Association honored him with the Dr. Albert Shumate Memorial Award in 2016, given to "a person, group of people, or organization for doing something remarkable to spark the preservation or remembrance of the city's history." The collection is frequently used by journalists and others due to its quality and relevance, but also because Max has not put limits on downloading his photos. There is a great example of this generosity in a post from a Bernal Heights neighborhood group by Todd Lappin (Lappin, T.).

The DIVA collection is grouped by neighborhoods, or parts of neighborhoods, and is searchable by keywords such as street names. Unfortunately, there is no overall general map of the city included in the collection to assist and guide users in their searching. Understandably, as the project began in the 1960s, the photos were all taken with film cameras that do not have geo-tagging. Adding geo-tagging will be an interesting project for the future, I hope.

601 Valencia provides an example of the comparisons that researchers can look for in the photos.

1983: *Southeast corner of 17th Street and Valencia Street*.
Description: "A two story industrial building, Carlos Arroyo and Sons Auto Body had been at this location

since 1936 and was a typical business on Valencia Street in the old days. In 2002, the building was demolished and replaced by a five-story condominium known as The Valencia."

2008: *The Valencia at the southeast corner of 17th Street and Valencia Street.*

Description: "Compare with photo from 1988 for an earlier view. Notice there is a small alley, Clarion, between The Valencia and Community Thrift; it is filled with murals."

After the University has provided scanned images for review, a volunteer works with Max to enter photo ID numbers, titles and other information. At present, Max works every morning but has volunteer typists only twice a week. Additional volunteers are more than welcome!

Prof. Kirkeberg's Key Map

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Waldo R. Tobler
(1930-2018)

Waldo R. Tobler, professor emeritus of geography at the University of California, Santa Barbara, died on February 20, 2018. He was 88.

Tobler spent the first 16 years of his career at the University of Michigan before joining UC Santa Barbara in 1977. He held the positions of Professor of Geography and Professor of Statistics at UCSB until his retirement. A famed cartographer, Tobler is best known in the discipline as the founder of the first law of geography, "Everything is related to everything else, but near things are more related than distant things," which he formulated while producing a computer movie. In fact, he has used computers in geographic research for over forty years, with emphasis on mathematical modeling and graphic interpretations. Tobler also was one of the principal investigators and a Senior Scientist in the National Science Foundation sponsored National Center for Geographic Information and Analysis.

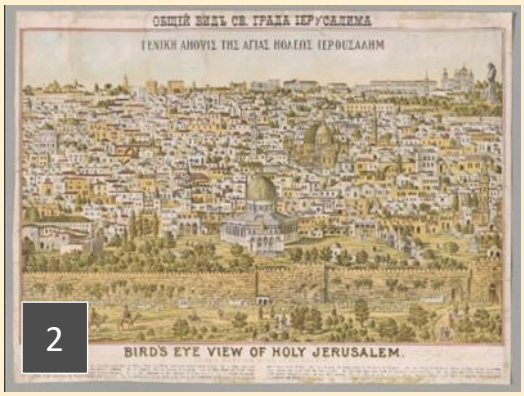
Tobler earned many honors for his work and contributions to geography. He was named Member of the National Academy of Sciences and Honorary Fellow of the American Geographical Society. He received the Osborn Maitland Miller Medal of the American Geographical Society for Outstanding Contributions in Cartography or Geodesy, the Meritorious Contributor Medallion of the Association of American Geographers, and the ESRI Lifetime Achievement in GIS Award among others honors.

Tobler earned a Ph.D. in Geography in 1961 from the University of Washington where he also received his master's (1957) and bachelor's (1955) degrees. The University of Zurich, Switzerland, awarded him an honorary doctorate in 1988.

A long-time member of the California Map Society, Waldo last gave a talk to our members in 2012 at the Los Angeles Public Library.

Urbano Monte Planisphere, 1587. David Rumsey Map Collection, Stanford Universiity

1

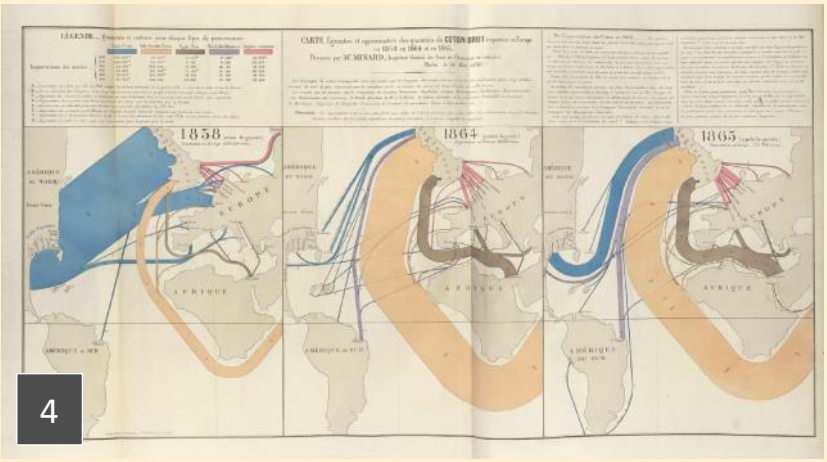


2

Bird's eye view of holy Jerusalem : Jesus weeping over Jerusalem, The Leonard and Juliet Rothman Holy Lands Map Collection at Stanford Universiity

3

Cartouche from General'naia karta Rossiiskoi Imperii, 1745. David Rumsey Map Collection



4

Cotton Trade, American Civil War, Graphic Tables and Figurative Maps, Charles Minard, Heritage Digital Library of Roads and Roads, accessed July 16, 2018 (École des Ponts ParisTech)

NOTABLE EVENTS AT THE DAVID RUMSEY MAP CENTER IN 2018

Illuminating the World before 1492: China, the Islamic World, and the Cross-Cultural Mapping of Asia , Hyunhee Park , PhD (February 12)

Making the World Go 'Round: How Urbano Monte Created his Map of 1587, pop up map exhibit and talk by Chet Van Duzer, **Image 1** (February 23)

Exemplars of Cartography Through Maps of the Holy Lands. Dr. Leonard Rothman, MD, **Image 2** (March 15)

Visualizing Time and Space through Foreign Eyes in Medieval China: From the Śārdūlakarnāvadāna to Amoghavajra's Xiuyao jing , Bill Mak, PhD (March 15)

California Map Society Annual Talks and Essay Competition Winner. *Men, Myths, and Maps: The U.S. Army Corps of Topographical Engineers and the Conquest of the West.* Imre Demhardt, PhD; *Enlightened Cartography: Mapping Imperial Russia* by essay competition-winner Ken Neff. **Image 3**. (April 5)

Understanding Ice: The James B. Case Memorial Symposium:

- *Mapping Ice,* Julie Sweetkind-Singer
- *Glaciology 101*, Dusty Schroeder & Rob Dunbar
- *Ice Penetrating Radar: Looking into Ice Sheets*, Dusty Schroeder
- *Back to the Future: How Knowledge of Past Changes in the Antarctic Ice Sheet our View of the Greenhouse Future*, Rob Dunbar
- *Ice on slippery slopes: Understanding the processes that govern rapid ice loss from Antarctica*, Jenny Suckale, (April 24)

Maps and Ships: Maritime Trade in the China Seas form the 16th to 18th Centuries , Dr. Richard Pegg (May 10)

But don't we know where everything is?: How to Map the Rest of It , Cartographer Molly Roy (May 24)

Data Storytelling with Thematic Maps: The Design Genius of Charles Joseph Minard, R.J. Andrews **Image 4** (May 24)

A Hidden Gem Wecomes Exploration

San Francisco Maritime National Historic Park Research Collection at Fort Mason, San Francisco

Juliet Rothman

Image above: Portion of interior mural at the Maritime Museum—one of several that cover the walls of the museum. These remarkable murals were created by Sargent Johnson and Hilaire Hiller in the 1930's.

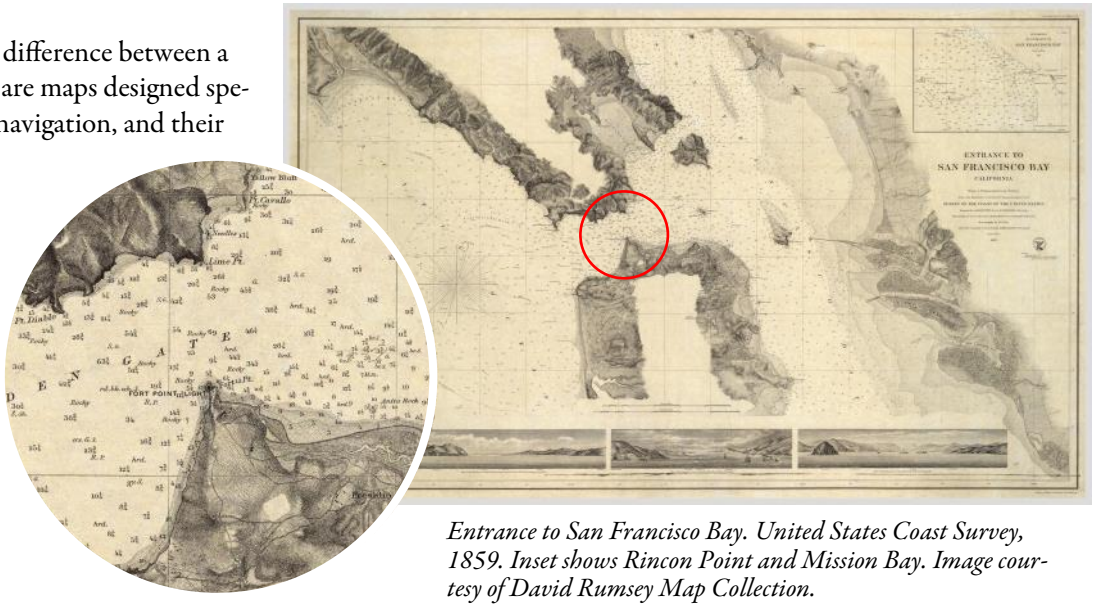
San Francisco Maritime National Historical Park's maritime research collection is hidden away in Building E of the Fort Mason complex on San Francisco's waterfront. It is the "premier resource for San Francisco and Pacific Coast Maritime history." (NPS, US Dept of the Interior). In addition to marine architecture and drawings, art, and artifacts, histories, photographs, and books, the collection includes—3,000 maps and sea charts!

The collection focuses on the maritime history of the San Francisco Bay area and Northern California, specializing in 19th through early 20th century maps and sea charts. Some of the collection focuses on reports and charts of coastal explorations, while other areas include California State Harbor Commissioner's reports with detailed maps. There are also artifacts, which include tools that mariners used in charting and navigation. The research collection at Fort Mason is the National Park Service's largest maritime museum collection. The process of cataloguing their map and sea chart collection has begun recently—and they welcome volunteers to assist with this important project.

I met with Gina Bardi, the collection's Reference Librarian, and with Heather Hernandez, Technical Services Librarian. They shared several of their favorite maps to illustrate some special areas of their collection.

It is important to recognize the difference between a "map" and a "chart." Sea charts are maps designed specifically to assist mariners with navigation, and their focus is on the water, rather than on the land. Sea charts indicate depths, obstacles, marine pathways, and other navigational needs. Depths are measured in feet or in fathoms (a *fathom* is a unit of measure generally used for water depth, equaling 6 feet, or 1.8 meters in length). Where there are illustrations of land, they are presented as *profiles*: views which a mariner would see *from water*, rather than land-based perspectives. In addition, Heather notes, sea charts are extremely accurate. Distance and scale are exact, which is not always true to the same degree with all maps. Because of this difference, and their maritime focus, the National Park collection has been organized with separate categories for "maps" and "charts"!

The first chart they shared is an 1853 chart of San Francisco Bay before the shoreline was filled in. The map shows an *isoline* – a line across the water marking where the depth is consistent. This was necessary for mariners and was used to determine how close to the land a ship might be able to navigate before becoming mired in the mud. The isoline marks the 3 ft. depth, while outside of this area, depth measurements are noted in feet or fathoms. Each measurement noted on the map was individually determined, and this is true of all sea charts. There was little access to land by ships in San Francisco prior to the Gold Rush in 1849, and, as we know, many ships were abandoned and sunk in San Francisco Bay by people impatient to reach the gold fields, often without charts of the Bay to guide them. The coast around the Bay is littered with shipwrecks. Between the



Entrance to San Francisco Bay. United States Coast Survey, 1859. Inset shows Rincon Point and Mission Bay. Image courtesy of David Rumsey Map Collection.

start of the Gold Rush and the time this map was drawn, wharves and piers were already beginning to be built, as can be seen on the map. Wharf building and dredging continued beyond 1853, as more and more eager miners arrived in San Francisco and headed inland.

The second map, an 1859 Mariner's Chart, is my personal favorite, and illustrates a different style of charting. The perspective is clearly from the water. Depths are measured very densely, especially around the entrance to San Francisco Bay. In addition, *bathymetric tints*, usually in color but here in shades of gray on this black-and-white sea chart, appear all along the East Bay. Tints from dark to light indicate changes in depth every five feet from the land mass—one for 1-5 feet, one for 5-10 feet, and one for 10-15 feet before reaching the paper's natural color for depths greater than 15 feet.

The chart also includes 2 lines that indicate the *ten fathom curve*. These show the curve of depth of the ocean just outside the entrance to the bay, indicating both edges of the 10-fathom area. The outer one extends up the coast, while the inner one goes from Marin to San Francisco. Another interesting feature is the shoreline detail, which is clear and very exact and meticulously developed, while the interior of the land masses are left blank. The interior was of little interest to navigators—so it was not described on the sea chart. The chart includes 3 beautiful "profiles" of rocks and shorelines— "because it's easy to miss the Bay altogether", as Heather notes.

Another item in the collection is a 1915 chart from the US Coast Guard. San Francisco Bay is clearly delineated, and depths are noted throughout, but this map contains an additional feature: broad pink lines define areas where no anchoring was permitted. It is uncertain why these specific areas were chosen: were there cable lines beneath the water? Did they indicate areas between Coast Guard bases and posts? Did they prevent impediments to marine travel? It's an intriguing mystery waiting to be solved! On the verso of the chart: a map of the Panama-Pacific Exposition. Clearly, the chart was drawn to illustrate areas for anchoring ships for visitors to the Expo.

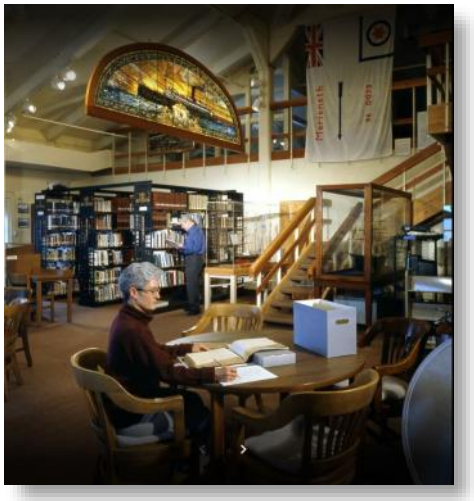
Gazing up the northern coast, a wonderfully detailed and exact sea chart in the collection maps the west coast of the United States from San Francisco to the Umpquah River. As was often the case, navigators brought sketch artists with them on their voyages of exploration and charting, and this chart has many sketches of different points along the coast, matching the "profiles" with the details indicated on the chart of the coast line.

Another fascinating map is a *silk map* (not of silk, but of a blend of materials that "feels" like silk) which was used by aviators and seamen during World War II. Because they were meant for use by both groups, these maps include wind as well as water details. The very special quality of these maps is that their colors and details do not fade or blur in water: they are meant to serve both sailors and aviators in emergencies, so that if they land in the water, the lightweight, waterproof maps are still legible, and can still serve to guide them to safety.

Two interesting maps of San Francisco in the collection include a 1923 map by M. M. O'Shaugnessey, the city's Chief Engineer. This not-to-scale map shows the materials which were used to pave each of the streets of the city, using different colors to indicate streets made of wood blocks, cobbles, concrete, brick, broken rock, basalt, and bituminous rock and asphalt. Another map on display was of the City and County of San Francisco drawn after the 1906 earthquake and fire. It indicates the area of the fire, and circular lines over the city to indicate the distances from the fire.

Although the focus is not on collecting older maps, the collection does include several. One of these is a 1700 map by the Dutch cartographer DeWitt, a very decorative map with rhumb lines and a beautiful drawing of ships at war, with smoke emanating from them, in the middle of the Bay of Biscayne. Another, back on our Pacific Coast, is a 1798 British map, the Plan of the River Oregan (the Columbia River).

The National Park Service's collection at Fort Mason is open to the public by appointment 1-4:30 PM Mondays through Fridays, and they warmly welcome visits from CMS members. Maps and charts of special interest to a visitor may be specifically requested for viewing. To schedule a visit, call (415) 561-7030, or write to safr_maritime_library@nps.gov. We plan to arrange a weekend meeting of the BAM group there in the future as well.



Maritime Research Center , 2 Marina Boulevard, Building E, 2nd Floor , San Francisco. Image courtesy of the National Park Service.

MAPPING HERE & THERE:
Meetings and Exhibits of Interest to Members

INTERNATIONAL SYMPOSIUM ON THE HISTORY OF CARTOGRAPHY, September 13-15, 2018, London. A symposium entitled *Mapping Empires: Colonial Cartography of Land and Sea,* will be held at the Weston Library, co-hosted by the ICA Commissions on the History of Cartography and Topographic Mapping and the Bodleian Library. Nineteenth century maps featuring Africa, Asia, the Americas, and Oceania will be featured.
https://icaci.org/invitation-to-the-7th-international-symposium-on-the-history-of-cartography-mapping-empires-colonial-cartographies-of-land-and-sea/

ROCKY MOUNTAIN MAP SOCIETY/SOCIETY FOR THE HISTORY OF DISCOVERIES JOINT MEETING, Sept 20-23, 2018, Golden, CO. The Colorado School of Mines in Golden, Colorado, near Denver, will host this conference. The theme, Gold Rush History, includes both *Golden Quest: Mapping the Stampedes*, and *Great Mountains of the American West*, with rocks and maps as well as guided tours to gold rush towns in the area, a ride on a steam engine train, a visit to a gold mine, and a tour of archeological and geological sites – and a presentation on the California and Nevada Gold Rush by our own Leonard Rothman.
http://www.rmmaps.org/2018-SHD-Conference/

WASHINGTON MAP SOCIETY, September 20, 2018, Washington, DC Charles (Chaz) Langelan, of the Surveyors Historical Society, will present a lecture on *The Lost Original Survey Maps of Georgetown* at the Library of Congress' Geography and Map Division, at 5 PM.
http://www.washmapsociety.org/WMSMeet.htm

SAN FRANCISCO MAP FAIR, September 21-23, 2018, San Francisco, CA. The 2nd SF Map Fair, featuring 20 exhibitors, will be held at "the Lodge", Regency Center, 1290 Sutter Street, and include a lecture series sponsored by the California Map Society. https://sanfranciscomapfair.com/

OSHER MAP LIBRARY, thru October 6, 2018, University of Southern Maine, Portland, ME, Art of the Spheres: Picturing the Cosmos since 1600, featuring detailed cosmological observations, both scientific and artistic.
http://www.oshermaps.org/exhibitions/art-of-the-spheres

NEW YORK MAP SOCIETY, October 6, 2018, "Patents and Cartographic Inventions: A New Perspective on Map History, a discussion by Mark Monmonier to be held at 5 PM at Avenues: The World School, 11 E 26th Street, New York. RSVP to mapsocietyNY@gmail.com.

IMCOS SYMPOSIUM, October 13-20, Manilla, Philippines and Hong Kong. This meeting will be held in two separate locations: Manila, Phillipines, from October 14-17, and Hong Kong, from October 19-20 (October 18th is reserved for travel between Manila and Hong Kong). The Manila portion will be held at the Ayala Museum, with the theme of SouthEast Archipelago. It will include pre-symposium tours, lectures, and visits to map collections, and is supported by PHIMCOS, the Phillipine Map Collectors' Society. The theme of the Hong Kong portion focuses on Cultural Encounters in Maps of China, and is hosted by the Hong Kong Maritime Museum and the Hong Kong University of Science and Technology, supported by John Wattis, Director of Wattis Fine Arts.
https://www.imcos.org/events/imcos-2018-symposium-hong-kong-manila/

WASHINGTON MAP SOCIETY, October 25, 2018, Washington DC. The meeting will be held in the Library of Congress' Geography and Map Division, at 5 PM
http://www.washmapsociety.org/WMSMeet.htm

CALIFORNIA MAP SOCIETY, November 3, 2018, Los Angeles, CA. The CMS Fall meeting will be held at the Los Angeles Maritime Museum, 600 Samson Way, San Pedro, CA. www.californiamapsociety.org

MAPS AND SOCIETY, November 8, 2018, London. A lecture entitled *Hernando Colon: Mapping the World of Books* by Prof. Bill Sherman and Dr. Edward Wilson-Lee will be held at the Warburg Institute, School of Advanced Study, University of London in Woburn Square at 5 PM. The lecture is sponsored by IMCOS and the Antiquarian Booksellers Association. http://www.bimcc.org/events/hernando-coln-mapping-the-world-of-books

MAPS AND SOCIETY, November 29, 2018, London. Prof. Vanessa Collingridge will present a lecture entitled *It's All Fake News! James Cook and the Great Southern Continent (1760-1777)* at the Warburg Institute, School of Advanced Study, University of London in Warburg Square, at 5 PM. The lecture is sponsored by IMCOS and the Antiquarian Booksellers Association. http://www.bimcc.org/events/it-s-all-fake-news-james-cook-and-the-death-of-the-great-southern-continent-1760-1777

BRUSSELS MAP CIRCLE, December 1, 2018, Antwerp, Belgium. The Brussels Map Circle celebrates its 20th anniversary at the Planin-Moretus Museum, a 400-year old former printers' home which is a UNESCO site.
http://www.bimcc.org/

WASHINGTON MAP SOCIETY, December 6, 2018, Washington DC. The meeting will be held in the Library of Congress' Geography and Map Division, at 5 PM.
http://www.washmapsociety.org/WMSMeet.htm

MAPS AND SOCIETY, January 17, 2019, London. *Bears with Measuring Chains. Early Modern Land Surveyors and the Record of European Physical Space* will be presented by doctoral student Desree Krikken from the University of Groningen at the Warburg Institute, School of Advanced Study, University of London, Warburg Square, at 5 PM.
https://www.maphistory.info/warburgprog.html

ANNUAL MIAMI INTERNATIONAL MAP FAIR, February 1-3, 2019, Miami, FL. The Map Fair will be held at HistoryMiami. http://www.historymiami.org/mapfair/

DAVID RUMSEY MAP CENTER CONFERENCE, February 14-15, 2019, Palo Alto, CA. A conference entitled *Mapping and the Global Imaginary, 1500-1900,* co-organized by the History Department at Stanford University and the Global History and Culture Centre at University of Warwick will be held at the Center at Stanford University. It will showcase research and develop conversations about the role of imagination in the field of cartography.
https://library.stanford.edu/rumsey/events

MAPS AND SOCIETY, February 28, 2019, London. Dr. Elizabeth Haines will present a lecture entitled *Labour Recruitment, Taxation, and Location: Mapping (and Failing to Map) Mobile Populations in Early Twentieth Century Southern Africa,* at the Warburg Institute, School of Advanced Study, University of London, Warburg Square, at 5 PM.
https://www.maphistory.info/warburgprog.html

MAPS AND SOCIETY, March 21, 2019, London. Prof. Martin Bruckner will present *The Rise of Monumental Maps: Aesthetics, Technology, and Material Culture* at the Warburg Institute, School of Advanced Study, University of London, Warburg Square, at 5 PM.
https://www.maphistory.info/warburgprog.html

AMERICAN ASSOCIATION OF GEOGRAPHERS, April 3-7, Washington, DC. The Association's Annual Meeting will focus on geography, sustainability, and GIS sciences. It will host 7,000 geographers and present over 5,000 lectures, posters, and workshops as well as guided field trips. All are welcome to this interdisciplinary forum.
http://www.aag.org/cs/calendar_of_events

CALIFORNIA MAP SOCIETY, April 13, 2019, Stanford, CA. The CMS Spring meeting will be held at the David Rumsey Map Center, Green Library, Stanford University
www.californiamapsociety.org

John Docktor, a long time member of the Washington Map Society, maintains a website bursting with news of the cartographic world. Check out: www.docktor.com

Answers to Carto-Quiz

Block Island. State of Rhode Island, east of Long Island Sound and 13 miles south of the Rhode Island coast.

Galešnjak (also known as 'Lover's Island'). Just off the coastline of Croatia in the Adriatic Sea.

Isle of Man. In the Irish Sea between Great Britain and Ireland. A self-governing English Crown Dependency.

New Caledonia. A "special collectivity" of France in the southwest Pacific Ocean, 750 miles east of Australia.

SE Farallon Island. Within the City & County limits of San Francisco, but 30 miles west. Closed to the public.

Taiwan. Officially the Republic of China; however the Peoples' Republic of China continues to claim sovereignty.

California Map Society Officers: 2018-19

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president@californiamapsociety.org

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William Warren	1997-2000
Glen McLaughlin	2001-2003
David Kalifon	2003-2005
Thomas B. Worth	2005-2007
Susan Caughey	2007-2009
Philip R. Simon	2009-2011
Fred DeJarlais	2011-2013
Len Rothman	2013-2015

Cover Image

Portion of Bradford Washburn's map of the Grand Canyon, 1978. (See page 9)

Become a Member!

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See *application insert enclosed with this journal.*

New members 2018

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James Canton
Zainab Cox
Beth English
Ameha Claire Fazio
Alexander Gao
Tina Glover
Travis Gradijan
Kay Hinn
Ed Hutton
John Isom
Anita Klune
Roger March
Betsy Mason
Nica Powell
Louise Ratliff
Dan Redemacher
Gerald Tyner
David John Williams

Calafia, *the name of our Society's Journal, was a fictional warrior queen who ruled over a kingdom of Black women living on the mythical Island of California.*

CMS: Who We Are

The California Map Society was founded in 1978 and became a non-profit corporation in 1987. We are a 501(C)(3)organization. Our purpose is to educate, preserve and disseminate information relating to historical and contemporary cartography, primarily that of California, both for our members and for the general public.

We do this by:

(a) holding conferences twice a year, one in the spring in Northern California and one in the fall in Southern California;

(b) sponsoring the annual California Map Society Graduate Student Paper, presented at Stanford University and in Southern California;

(c) sponsoring the California Map Society Lecture Series at Stanford Libraries and in two Southern California locations;

(d) sponsoring a college student paper competition each year in Northern and Southern California;

(e) creating and maintaining a website that disseminates information worldwide about the Society, cartography and related matters;

(f) educating the public through occasional publications and media presentations;

(g) supporting advancement in map production, utilization and preservation; and,

(h) encouraging research and teaching in the field of cartography.