

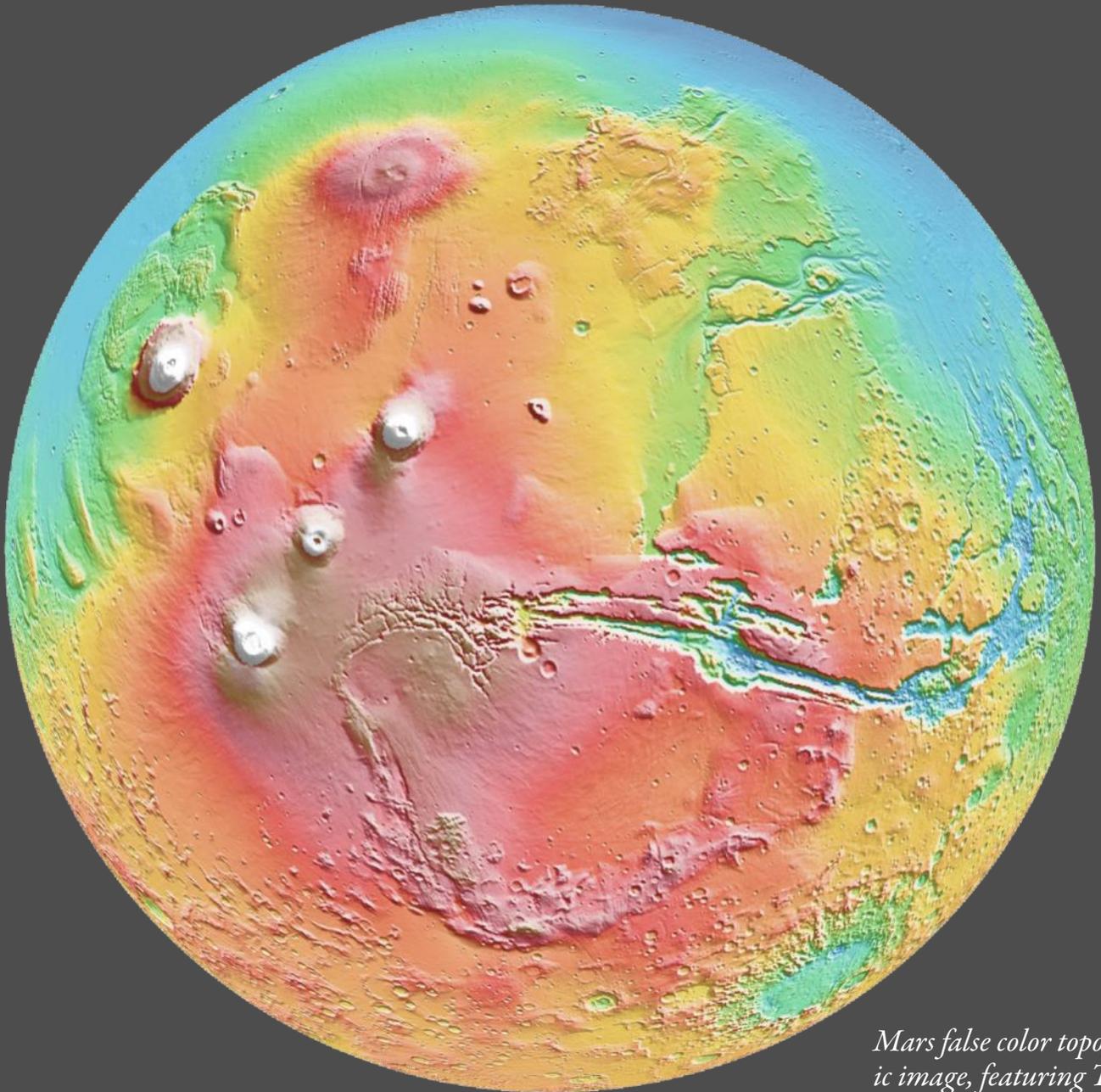


# CALAFIA

THE JOURNAL OF THE CALIFORNIA MAP SOCIETY

MARCH 2020

---



*Mars false color topographic image, featuring Tharsis topographic rise (red & white areas), NASA/JPL*



# Old World Auctions

Specialist in  
Maps & Atlases  
Since 1977

"Quality material. Nice people to deal with.  
**A wonderful experience every time."**

- Douglas R.

We're not your typical auction house. We work hard to build trust in all that we do. Our customers keep coming back to us because we offer:

Accurate condition reports

100% money-back  
guarantee (on condition reports)

Certificates of authenticity

Specialized expertise

Easily searchable  
pricing guide

Great customer service



Eliane & Jon Dotson, Owners

[oldworldauctions.com](http://oldworldauctions.com)

(804) 290-8090  
[info@oldworldauctions.com](mailto:info@oldworldauctions.com)



### Contents

<i>April 2020 Meeting</i>	3
<i>President's Letter</i>	4
<i>Editor's Note</i>	5
<i>CMS Education Fund</i>	5
<i>Meeting Program</i>	6
<i>Library Map, Directions</i>	7
<i>Fall Meeting Recap</i>	8
<i>My Favorite Map</i>	11
<i>Carto-Quiz</i>	13
<i>Meet Our Member</i>	14
<i>Apps for Maps</i>	15
<i>Mapping Asteroids</i>	17
<i>Moon Mapping / Naming</i>	18
<i>Book Review</i>	24
<i>Historic Mars Mapping</i>	25
<i>Wayfinding on Mars</i>	29
<i>Rogue Photo of Earth</i>	33
<i>Celestial Map Primer</i>	36
<i>Teaching Astronomy</i>	40
<i>LOC Treasures</i>	43
<i>Rumsey Map Ctr Events</i>	47
<i>Bay Area Map Group</i>	48
<i>SF Map Fair</i>	50
<i>Student Paper</i>	53
<i>Mapping Here/There</i>	63
<i>Gerald Greenberg</i>	66
<i>CMS Information</i>	67

### Calafia : The Journal of the California Map Society

Juliet Rothman, Editor  
 Fred DeJarlais, Publisher  
 The journal is published bi-annually by the Society.

\* [www.what3words.com](http://www.what3words.com)

# CALAFIA

THE JOURNAL OF THE CALIFORNIA MAP SOCIETY

Volume 2020, Issue 1 — March 2020

[www.californiamapsociety.org](http://www.californiamapsociety.org)

## SPRING MEETING, APRIL 25, 2020 SAN FRANCISCO PUBLIC LIBRARY—MAIN LIBRARY

N37° 46' 45", W122° 24' 59" ///print.hopes.cared\*

Saturday, April 25, 2020, 9:15 am to 5:00 pm  
 100 Larkin Street, San Francisco, CA 94102

### Our 87th Regional Meeting!

Our Spring Meeting will include a wide array of topics from the 14<sup>th</sup> to the 21<sup>st</sup> Centuries and will be held at The San Francisco Public Library, Main Branch, 100 Larkin Street, San Francisco, CA. There will be no registration fee.

The morning will begin at 9:15 am with Morning Hospitality (coffee, tea, and pastries) in the Latino/Hispanic Room, first floor. (The hospitality is for CMS Members only.)

At 10:00 am, we will convene in the Koret Auditorium for welcomes by President Jon Jablonski, Vice President Ron Gibbs, and City Archivist, San Francisco Public Library, Susan Goldstein.



See page 7 for Facility Map & Directions

Our first speaker will be **Courtney Spikes of Los Angeles, CA**. Her topic will be: *Mapping Paris After Haussmann*. In 1860, Emperor Napoleon III unilaterally altered the map of Paris—doubling its size and quadrupling the population. City planner Baron Haussmann, deep into his 20-year renovation project, reconfigured the map of France's capital into the 'city of light' we celebrate today. Courtney earned her degrees from the University of Pennsylvania and UCLA. She lectures at Loyola Marymount University and serves as a historical consultant for television and feature films.

Our second speaker will be **Susan Schulten of Denver, CO**. Susan will speak on: *How Maps Made America*. Whether handmaidens of diplomacy, instruments of social reform, or even advertisements, maps have both reflected and shaped American history. Here Susan uses maps to narrate some essential maps that mattered from the voyages of discovery to the digital age. A professor of history at the University of Denver, Susan authored three books on cartography including *A History of America in 100 Maps* (2018) and *Mapping the Nation: History and Cartography in Nineteenth-Century America* (2012), which received the Norris Hundley Prize from the Pacific Coast Branch of the American Historical Society. She has spoken in the Bay Area on other recent occasions.

We'll have a break from 11:45-1:00pm to have lunch on your own at one of the nearby restaurants. A list of nearby restaurants is provided on page 7 of the journal.

Our first speaker after lunch will be **Richard Breiman of Alamo, CA**. Rich will speak on: *The Remarkable Life and Legendary Voyages and Discoveries of Captain James Cook, the Greatest Explorer of the 18th Century*. Historical maps, engravings, and journal excerpts will illustrate the presentation. Rich is a retired University of California San Francisco Professor of Radiology and an avid life-long collector, most recently of antiquarian maps, prints and books, including the British Admiralty's official authorized journals, maps and engravings from Captain Cook's expeditions.

Next, **Jonathan Van Coops of San Francisco, CA** will present a personal story, entitled *Revolution, Maps, and Family: El Rondin-Campaigns of Toribo Ortega and Jose de la Cruz Sanchez during the Orozco Rebellion of 1912*. Jonathan is the great-grandson of Esteban Luján, who authored "El Rondín" during the Mexican Revolution. Using several beautiful historical maps, he will illustrate the geographic context and conditions that led to Orozco's rebellion. As a geographer and cartographer, Jonathan enjoyed a 40-year career leading the California Coastal Commission's Mapping and GIS (Geographic Information System) Program before retiring in 2015.

At 2:30-3:00pm, we'll have a short break in the Latino/Hispanic Room, first floor, again for Members only.

Then, **Tom Paper and Jim Schein of San Francisco, CA** will make an innovative presentation, entitled: *A Pop-up Exhibit on the Cartographic History of San Francisco*. Covering 1507 to the present day, this exhibit reveals the key maps that have uncovered and articulated what is San Francisco. Tom is a Managing Partner of Webster Pacific, a location analytics consulting firm, and Jim is the owner of Schein & Schein, a local business specializing in vintage maps and prints.

The last lecture will also be a novel one as **Juliet Rothman of San Francisco and Fred DeJarlais of Capitola, CA** will present *Calafia: Bringing a Professional Cartographic Journal to Life*. As a member of professional journal Advisory Boards, and as a long-time President and leader of the California Map Society, respectively, Juliet and Fred, editor and publisher of our journal, *Calafia*, will discuss the arduous, but rewarding path of transforming the Society's newsletter into a publication that reflects the multifaceted interests of our members and attracts the attention of the wider cartographic world.

The program will conclude with a short **Business Meeting**, beginning at 4:30pm, in the Koret Auditorium.

## PRESIDENT'S LETTER

JON JABLONSKI,  
CMS PRESIDENT

Dear Society members and friends:

Spring greetings from the board and from myself personally. I am writing on a Sunday afternoon after noticing our first iris of the spring here on the Central Coast. That got me to thinking about the wide range of landscapes in the state, and all the different ways we describe Northern versus Southern California. I think we will visit this topic at our fall meeting in the South.

First, though, we have our April 25th spring meeting at the San Francisco Public Library—the Main Library. This is another meeting that we are thrilled to host with no cost to members or the general public. The last time we met at SFPL, more than 125 people attended. Others poked their heads in throughout the day—either for individual talks, or just curiously passing through. I wouldn't be surprised if we reached more than 200 people that day. I am very much looking forward to a repeat! See inside this issue for more details.

Of course, next year, we will return to the Rumsey Center at Stanford University. Over the past five years, the Rumsey Center and we have partnered using money *outside of membership dues*. These funds were raised from members who have the ability and desire to donate above their membership. These funds enable our annual author talk and student paper competition dues-- both of which are presented in the South—as well as the Northern meeting every-other-year.

The board unanimously voted to start fundraising for another five-year cycle of programming. We have set the goal at \$25,000. As a board officer, I know there were gifts of multiple-thousands-of-dollars. As a state employee, I well know that most of us in California don't have that much in our annual giving budgets. If you are a person of such means, I will challenge you to donate the entire \$25k and then, in turn, challenge the board to fundraise for an additional set of activities. If you donated the first time around, please consider donating at a higher level, and make the same challenge to the board. And if you are like me and like what we've been doing over the past few years, kick in whatever you feel comfortable with. I don't care if it's five or five hundred dollars, but also challenge our board to do more. Finally, please consider adding a donation of some of your time and energy in the coming year.

## EDITOR'S NOTE

Our Spring issue's theme is the mapping of space, chosen in honor of the 50<sup>th</sup> anniversary of the Apollo moon landing, and we include a number of articles on this fascinating subject in our Journal. Our own Nick Kanas, whose special interest is space mapping, shares an "Historical Primer" on celestial maps, Robert Garfinkle, a scholar of the history of astronomy, takes us on a 400-year journey of the mapping and naming of locations on the moon, and Henri Lese, a docent at the California Academy of Science, shares the history of mapping our nearest neighbor, Mars. NASA scientist Fred Calef's description of the Mars Rover missions gives us special insights into the specifics of Mars exploration.

We learn about Dale Shellhorn's rogue photo of earth from deep space, taken while looking back from an outward-bound space mission, from Curtis Bird of the Old Map Gallery in Denver, and some of the details of the process of mapping asteroids from a presentation by Dr. Edward Lu, Director of the Asteroid Institute at the Rumsey Center. Chris Lane from the Philadelphia Print Shop West shares what was probably the first attempt at a formal education about astronomy in the NY public school system, Asa Smith's 1848 "Astronomy Atlas."

Two of our regular features are also space-oriented: Leonard Rothman's My Favorite Map article features a map of "The Deluge", given a date of 2348 B.C. by its author, Edward Quin, which appears in his 1836 "An Historical Atlas", and a review of the newest edition of Nick Kanas' "Star Maps" book by Jonathan Crowe.

Apps for Maps features Nicole Martinelli's Resilience Maps, a system of mapping essential information for emergencies. Using her article, we can each follow her process, and thus be prepared for any emergency—a really important project to ensure safety! We Meet Our Member Wally Jensen, and learn of his interesting life experiences, explore meetings and conferences in Mapping Here and There, and test ourselves on Fred DeJarlais' Carto-Quiz. This edition also includes my own article on some special cartography treasures in the Library of Congress, Fred's summary of noteworthy recent events at the Rumsey Map Center, an article on last September's San Francisco Map Fair, and a summary of last fall's two wonderful area meetings: the BAM (Bay Area Map Group) meeting at Ron Gibb's home, and the South California Regional Meeting at the Westchester Loyola Branch Library. We also include a treatise on the

*continued at EDITOR, page 7*

## CMS EDUCATION FUND

The California Map Society Education Fund was established in 2014 by the Society to support scholarly activities around the state. During the first five years, we sponsored an annual lecture by a noted author or other expert in the field of cartography, as well as an annual student paper competition. Lectures are held at the David Rumsey Map Center at Stanford University, which co-sponsors the program, and one or more venues in Southern California. The Fund provides transportation, accommodations, and an honorarium for both the lecturer and the award winner. This issue of Calafia features the scholarship of the 2019 award recipient, Geoffrey Oliver Lewis.

The Education Fund has been successful in achieving its financial goals for our first five-year term. At its fall, 2019 meeting, the Board of Directors unanimously voted to renew the program with a new round of fundraising. **We have set a goal of raising \$25,000 to support the program through 2024.** We encourage past contributors to extend their generosity and help us to continue this worthy program. We hope that members who have yet to contribute to the Fund will make a financial commitment to the program.

Sponsors of the Education Fund include:

### Gold

Pat Boyce  
John Fleming  
Fred DeJarlais  
Leonard Rothman

### Silver

Warren Heckrotte  
Nick Kanas  
Glen McLaughlin

### Bronze

Juan Ceva  
William Eaton  
Anthony Farndale  
Robert Golden  
Philip Hoehn  
Wally Jansen  
Barbara Keck  
George Piness  
Dorothy Raphaely  
Walter Schwartz  
Julie Sweetkind-Singer  
Bill Warren

The Society is grateful for our contributor's support of this important program. Please consider adding your name to this very special list by making a donation to the Fund!

# CALIFORNIA MAP SOCIETY

Spring Conference at San Francisco Public Library

100 Larkin Street

Saturday, April 25, 2020

## Program Schedule

9:15 – Morning Hospitality in Latino/Hispanic Room, first Floor, Members Only

10:00 – Welcome by President Jon Jablonski, Vice President Ron Gibbs, and City Archivist Susan Goldstein in Koret Auditorium

10:15 – **Courtney Spikes**, *Mapping Paris after Haussmann*

11:00 – **Susan Shulten**, *How Maps Made America*

11:45 – Break and Lunch on your own. A list of nearby restaurants will be provided, and the café of the Asian Museum is just across the street.

1:00 – **Richard Breiman**, *The Remarkable Life and Legendary Voyages and Discoveries of Captain James Cook, the Greatest Explorer of the 18<sup>th</sup> Century*

1:45 – **Jonathan Van Coops**, *Maps and Family: El Rondin-Campaigns of Toribo Ortega and Jose de la Cruz during the Orozco Rebellion of 1912*

2:30 – Break in Latino-Hispanic Room, first floor – Members only

3:00 – **Tom Paper and Jim Schein**, *A Pop-Up Exhibit on the Cartographic History of San Francisco*

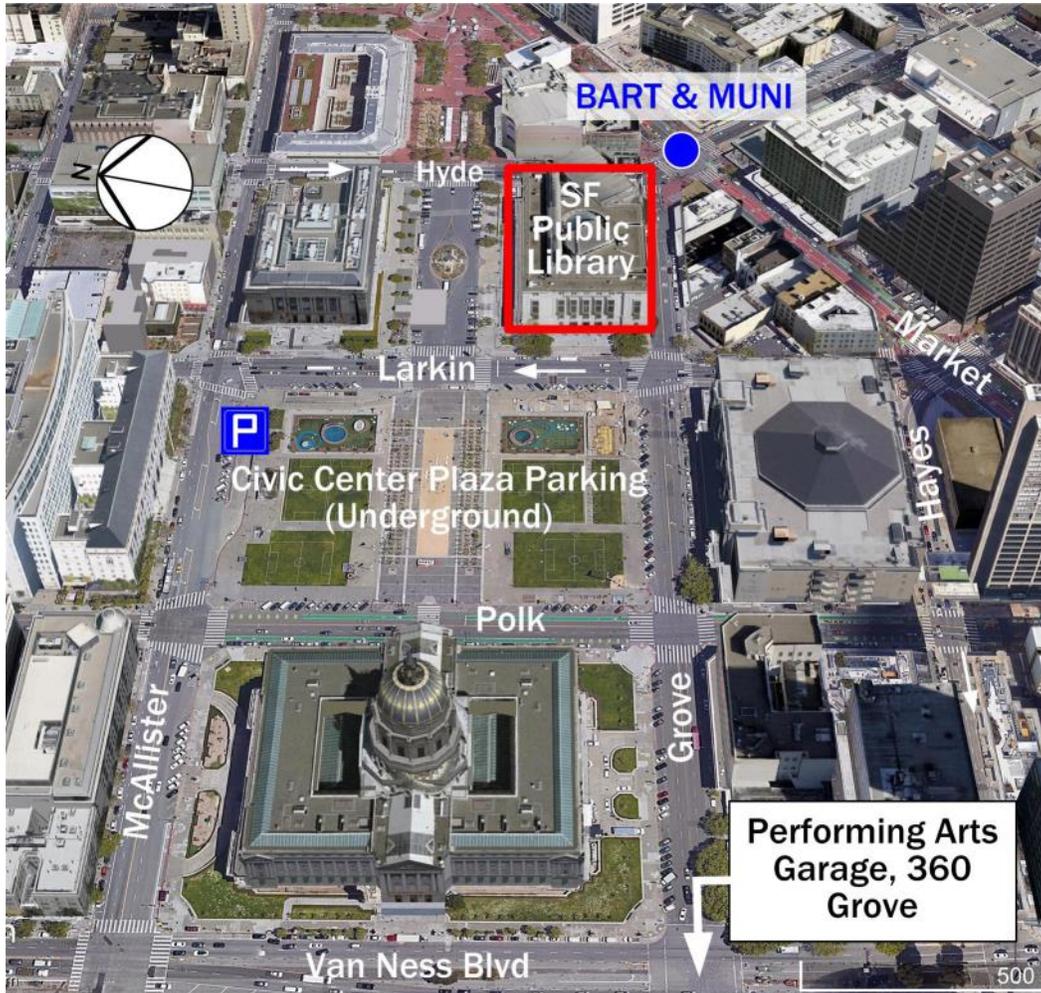
3:45 – **Juliet Rothman and Fred DeJarlais**, *Calafia, Bringing a Professional Cartographic Journal to Life*

4:30 – A brief Business Meeting

Please see page 3 for a more expansive description of presentations that will be provided at this meeting

FOR YOUR CONVENIENCE LOOSE SHEETS CONTAINING PROGRAM, MAPS & DIRECTIONS AND MEETING REGISTRATION INFORMATION ARE ENCLOSED WITH THIS ISSUE

# Directions, Parking & Food



<https://sfpl.org/locations/main-library/about/parking-main-library>

*EDITOR, continued from page 5*

early colonial history of the Hawai'i written by Geoffrey Oliver Lewis, winner of this year's Student Writing Contest—a contest co-sponsored by CMS and the David Rumsey Map Center.

We hope that everyone plans to attend our Spring meeting, coming very soon at the San Francisco Library, and full details about the meeting, location, and presentations are included here. We look forward to seeing you!

We hope that you enjoy our Journal, and hope to continue to present articles on different themes in each edition. Our fall issue of Calafia will feature city mapping. We welcome suggestions for future themes, and strongly encourage members' contributions on their areas of special interest—these are truly essential to our effort.

*Juliet Rothman, Editor*

Sam's Diner

[http://www.samssf.com/?utm\\_source=tripadvisor&utm\\_medium=referral](http://www.samssf.com/?utm_source=tripadvisor&utm_medium=referral)

Ananda Fuara (vegetarian)

[https://www.anandafuara.com/?utm\\_source=tripadvisor&utm\\_medium=referral](https://www.anandafuara.com/?utm_source=tripadvisor&utm_medium=referral)

Gyro King

<http://www.gyroking.co/>

Soluna

[https://www.solunasf.com/?utm\\_source=tripadvisor&utm\\_medium=referral](https://www.solunasf.com/?utm_source=tripadvisor&utm_medium=referral)

Lalitha Thai

[http://www.lalithasf.com/?utm\\_source=tripadvisor&utm\\_medium=referral](http://www.lalithasf.com/?utm_source=tripadvisor&utm_medium=referral)

The Market at the Twitter Building

<https://visitthemarket.com/>. A gourmet food mall



commission commemorating the 400<sup>th</sup> Anniversary of Sir Francis Drake's expedition and brought out a book on the topic. Bill reminisced about other books, including *Maps and Civilization*, titled initially *Maps and Man*.

*Trish Caldwell, Ph.D.*, noted her early experience with thematic mapping at the CIA and her eventual move to UCLA and her studies with Norman. There she realized more people viewed maps on television news than in any other format, a topic that led to her dissertation. In 1979, somewhat to her surprise, Norman approved her dissertation on such mapping, while only changing five words in her work!

*Julie Sweetkind-Singer* appreciated his influence on her life. After reading the acknowledgments in *Maps and Civilization*, she observed references to UCLA map librarians. Realizing that map librarian was a potential career, she was inspired, and eventually reached her current role as Assistant Director of Geospatial and Cartographic Services librarian at Stanford University.

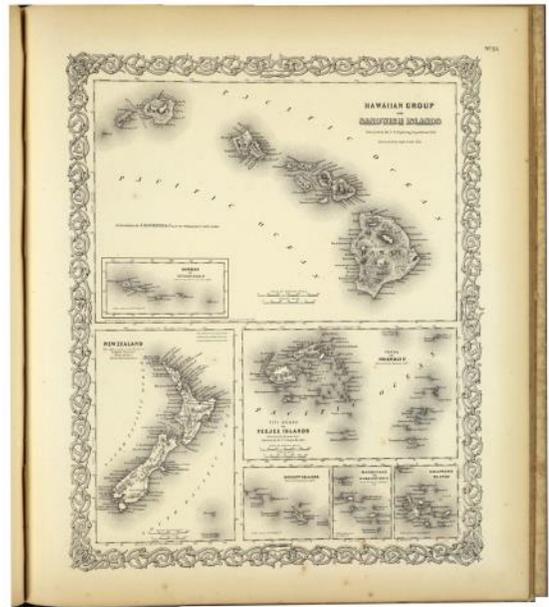
*Fred DeJarlais* met Norman in 2006 at a CMS in San Francisco, assisting him in his presentation to our members. Fred was pleased to be able to use Dr. Thrower's early work in photogrammetry in a recently authored article for the *Calafia* Journal.

Video greetings were recorded to present to Norman.

**Maps as Mirrors and Methods of Colonialism in Hawai'i**  
*Student Essay Award winner: Geoffrey Oliver ("Oliver") Lewis*  
Oliver, who grew up on Oahu, told us of Captain Cook's 1778 landing and presented a 1785 map of European colonization. Oliver explained that initially, land was not seen as a commodity, but as something higher than humans.

The earliest ca. 1785 maps used phonetic spelling that varied in sound and spelling from currently adopted names. An 1856 J.W. Colton map established the current spelling and even Hawaiian pronunciations. An 1891 D. Appleton map used in Hawaiian schools showed Hawaii, then still independent, together with Alaska and the western United States, establishing a sense of it being related to the United States.

Oahu maps revealed that in 1848, King Kamehameha established the validity of land ownership. This changed traditional concepts of the environment. Young native C.J. Lyons' map of Oahu established ownership of many land tracts. By 1899, extensive non-Hawaii land ownership of Oahu was mapped. Missionaries use of maps marginalized Hawaiians who held a non-ownership-based concept of land.



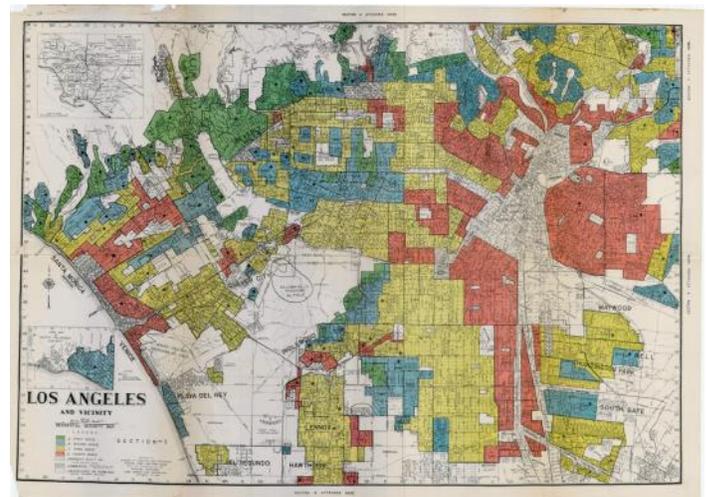
Colton, G.W., *Hawaiian Group or Sandwich Islands*, 1856. Courtesy of davidrumsey.com

Mr. Lewis's complete essay is reproduced elsewhere in this issue of *Calafia*.

**Redlining in Los Angeles, Carlos Baez, PhD candidate at UC Santa Barbara.**

Carlos aimed to deconstruct maps to determine the factors involved in residential redlining.

The genesis of redlining was that the 1934 Federal Home Loan Banking Board (FHLBB) wanted to standardize then-inconsistent methods for making home loans. They included Hoyt's Chicago School of Sociology concept that race should be considered in valuing property, and that mixing of races will accelerate property value decline.



*Los Angeles Redlining Map, 1939. Image courtesy of KCET, Los Angeles.*

Maps were color-coded to show desirability of areas.

Population criteria included data categories for nationality, foreign family percentage, and negro.

### Where We Are: Westchester is not a Blank Place

*Jon Jablonski, University of California Santa Barbara.*

Jon used a series of GoogleEarth and other historical aerial photos to show changes to the Westchester area since the 1920s.

### Mapping the Comstock Lode, Julie Sweetkind-Singer, Stanford University

Julie used interactive Stanford library-resourced maps and photographs to describe the Comstock silver mine and Virginia City/Gold Hill and discussed the mine's boom-and-bust history.

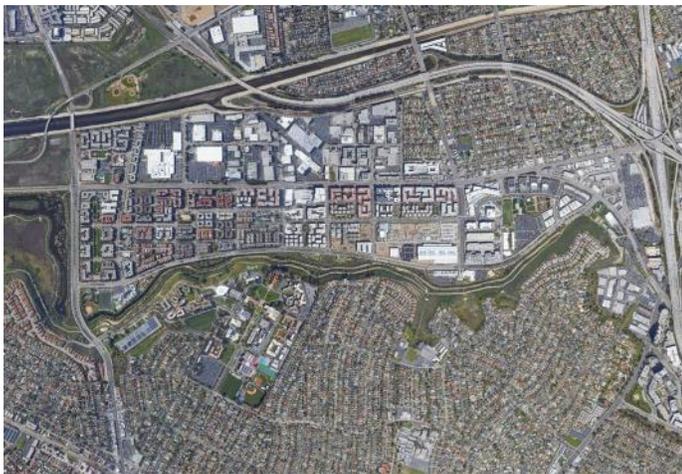
She included a historic infographic (right) with a cross-section view of the mines and claims and the proposed Sutro Tunnel, as well as other claim maps.

### Three Women Pictorial Cartographers:

#### A Study in Contrasts, Judith Tynner, Ph.D.

Judith has been working with maps made by women for the past 20 years. She remarked that the topic of women in cartography has been largely ignored until recently, as has pictorial maps.

1920 through 1960 was perhaps the golden age of pictorial maps, and many of the most visually attractive and informa-

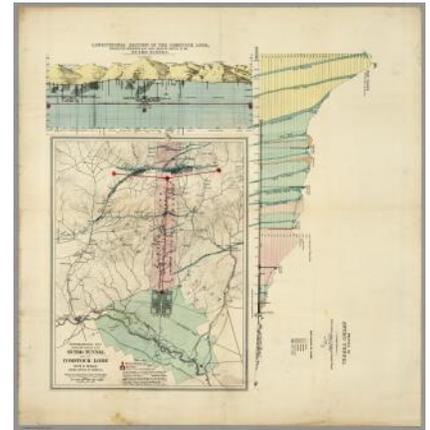


*Recent Google Earth image of the Westchester area.*

tive were produced by women. Many women worked as part of a team or in government agencies, so they may be hard to identify. The majority had their training in art. Each woman's profile, below, had a distinctive style.

Ruth Taylor White (1896-1985) – Stanford, NY Institute of Art and Design. White coined the term “cartograph” for her map style. She often

*Stanford's Geographical Establishment, Sutro Tunnel And The Comstock Lode, 1873. Image courtesy of davidrumsey.com*



used a cartoonish format. However, people, especially African-Americans, were often stereotyped unflatteringly.

Louise Jefferson (1908-2002). Jefferson attended Columbia University. An African-American, her most famous work, was a U.S. map, “Americans of Negro Lineage” (1946). People on her maps were not stereotyped. A 1944 map, “Indians of the U.S.A.,” positioned representative people by location.

Alva Scott (1902-1993). Some references to her appear with last names of her two husbands (Mitchell, Garfield), making identification of her work challenging. Her maps were basically tourist maps, with more focus on points of interest than on people. She sometimes incorporated a sly sense of humor (see insert on the Salem map).

President Jablonski closed the day with a brief member's meeting. Our Treasurer, John Fleming, who that the Society's financial position remains strong, and Fred DeJarlais, VP, Membership, reported that membership growth has been robust, with a 12% one-year increase and a 33% increase since 2017. Fred, as



*White, Ruth Taylor, Plate from “U.S.A. A Gay Geography”, 1935. Image courtesy of Old World Auctions.*

Calafia publisher, reflected that the expanded journal has been warmly received by CMS members, with strong interest from contributors. With production costs increasing, he will be seeking additional advertisers for forthcoming issues.



Jefferson, Louise. "Americans of Negro Lineage", 1946. Image courtesy of othercartographies.com



Garfield, Alva Scott. "A Scott-Map of Salem Massachusetts," 1960. Image courtesy of davidrumsey.com

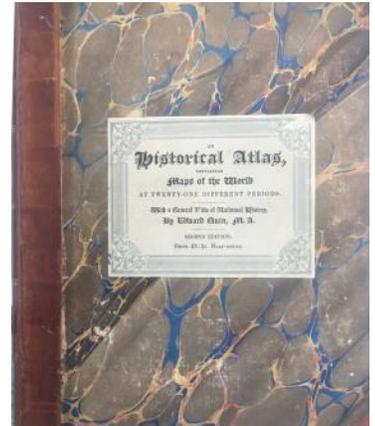
The CMS Spring meeting is scheduled for Saturday, April 13<sup>th</sup> at the Rumsey Map Center at Stanford University – please read about plans for this meeting in this issue, and plan to attend.

*Fred DeJarlais  
and Walter Schwartz*

## MY FAVORITE MAP LEONARD ROTHMAN, M.D.

As a map collector, my focus has been maps of the Holy Land. In my wanderings through libraries, collections, and map dealers in search of maps of the Holy Land, I came across a map in an atlas that was like no other I had ever seen. Intrigued, I read the accompanying description, immediately purchased it, and added it to my collection.

This fascinating map was designed by Edward Quin (1794-1828), and engraved by Sidney Hall. It was published in London in 1836 by E.B. Seeley and W.B. Burnside, in their second edition of Quin's "An Historical Atlas: In a Series of Maps of the World as Known at Different Periods." I have chosen this map as my favorite both because it is a very rare and unusual cartographic presentation of the Holy Land and biblical events, and because it also represents an unusual view of space as a completely black void which shrinks over time.



The title of the map, *B.C. 2348. The Deluge*, is based upon the determination by James Ussher (1581-1686), the Archbishop of Armagh, that the creation of the world occurred on Sunday, October 23rd, 4004 BCE, and that the biblical flood occurred much later, specifically on May 5th, 2348 BCE.

The map is meant to serve as an illustration of the story of Noah, in the book of Genesis. In this well-known story, God has decided to destroy all of the inhabitants of the world because of their wickedness. However, because of their exemplary behavior, God has determined that Noah and his wife, their three sons, Ham, Japhet, and Shem, together with their wives, should be saved, along with two of every other living creature. Noah is commanded to build a large wooden ship, which we know as the Ark, which will serve as a refuge for them during the Deluge.

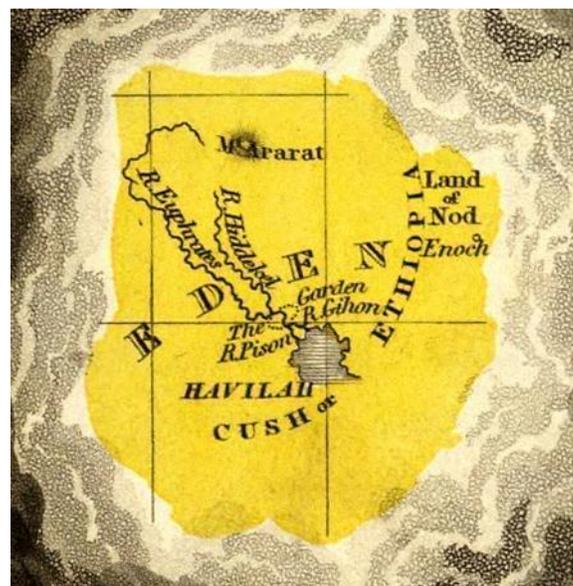
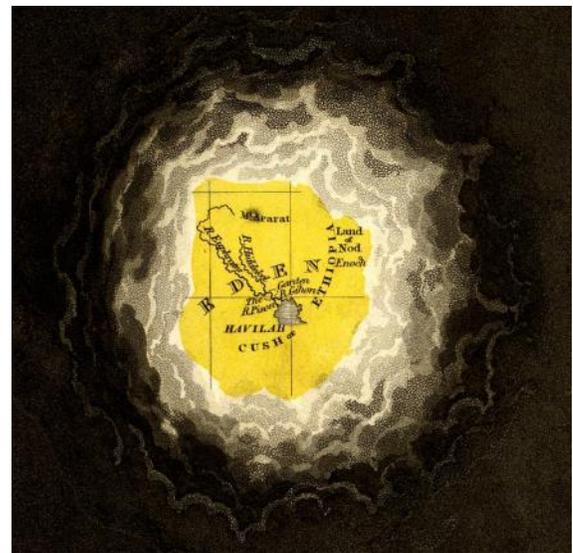
The map itself shows the world as it was assumed to look at the time of the Deluge. It is approximately 9 3/4 inches high x 10 3/4 inches long (105 square inches) and is almost completely black. The only light appears in the lower-left quadrant, which contains just a 5.1 square inch circle of what appears to possibly be clouds, which progressively lighten to gray

and then to white as they move toward the center of the circle. The small center, an inset map of Eden, is yellow, possibly representing bright daylight. Thus, in this map, both the biblical concept of darkness turning into light with Creation, and the vastness and darkness of the surrounding space are well portrayed. Interestingly, no stars, which, according to Genesis, were created on the fourth day, are represented in the darkness on this map. Genesis does not mention the Garden of Eden at all until after the 7th day, so that the stars, created well before, should logically be included on the map as well.

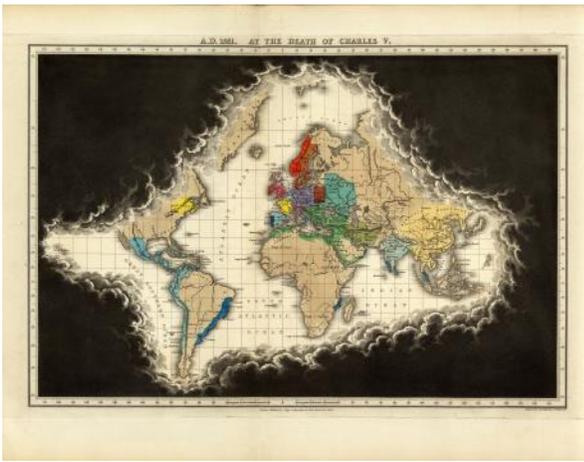
Located at the center of the yellow inset, the garden of Eden is shown with its four rivers: the Euphrates, the Tigris (here noted as the Hiddekel), the Pishon, and the Gaon. Mount Ararat, purportedly the landing place of Noah's Ark, is also noted. Cain was exiled to the Land of Nod (Hebrew, to wander), and Enoch, also on the map, was named after his first son by his wife. Ethiopia and Cush (currently southern Ethiopia) are also noted. This is the area where the Ark of the Covenant, the other biblical Ark, noted in the Book of Exodus, is said to reside. According to Ethiopian biblical history, the Ark of the Covenant was taken to Aksum, Ethiopia, from King Solomon's Temple in Jerusalem by Melenik I, the first Emperor of Ethiopia, the son of Solomon and the Ethiopian Queen of Sheba.

This diachronic, narrative map, which includes multiple events at different epochs in biblical history, is the first map in *Quin's atlas*, and then the maps in the atlas move forward in time until 1828, just prior to the 1836 year of the atlas' publication. Pivotal events during different periods are presented through the series of 21 maps and accompanying descriptions. As the known world enlarges, the events included occur in different parts of the world. Although the overall size of each map remains the same, the areas of darkness recede, and the detailed areas of the insets become larger over time, presenting an interesting but very unrealistic view of the earth/space relationship. Finally, the last three world maps, which are also twice as large as the preceding 18, have no dark area. An entire first edition of this atlas can be viewed on Stanford University Library's [Searchworks](#) website.

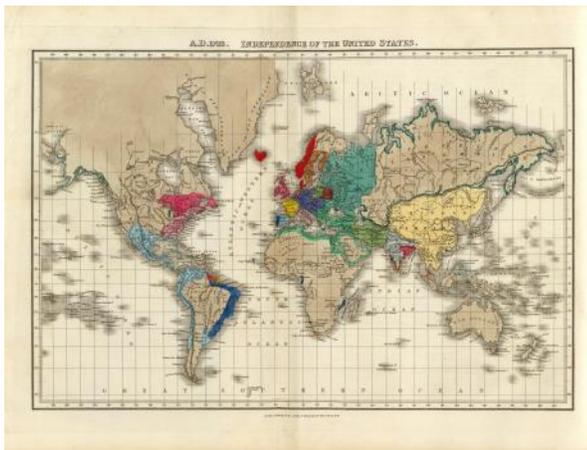
Perusing the *New York Times* in December 24th, 2019, as I was preparing this article, I was immediately struck by an article entitled "We Stared Into the Void. It Stared Back", by Michael Roston, which included an image of a black hole from the center of the Messier 87 galaxy (online version: "[What we Learned in Space ...](#)"). While it is noted that it is a "false-color" image, it is striking to see its similarity to *Quin's!* The small "black hole" at the center is surrounded by a larger yellow-orange circle. It is placed off-center in the image—and it is surrounded by a completely black void



*Images above of the Deluge—Progressive enlargements*



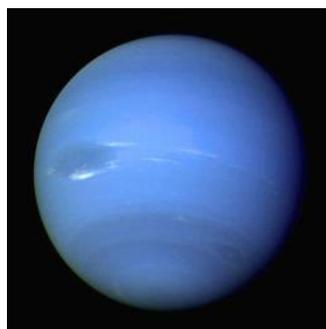
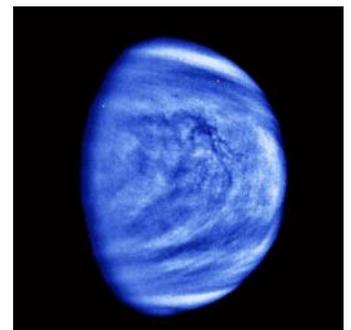
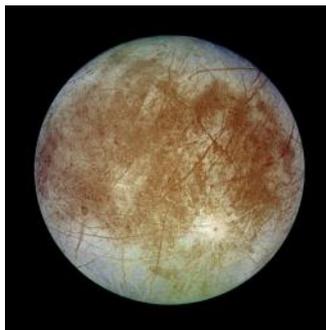
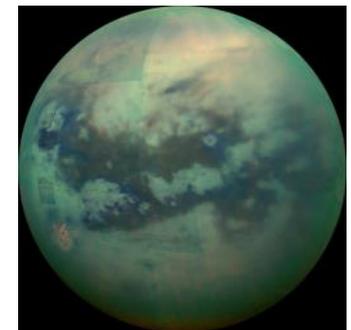
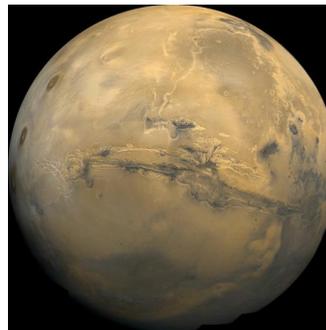
1551—*The Death of Charles V*



1783—*Independence of the United States*

## CARTO-QUIZ

Name the Planet or Moon!  
(Extra credit: moon around which planet?)



### Bibliography

- 1 Craig, G.Y. & Jones, E.J. (1982) *A Geographic Miscellany*, Princeton: Princeton University Press.
- 2 "Kebra Negast," Ethiopian manuscript of the 14th century CE. based on manuscripts of the 2nd-4th century, validating the history of the Solomon-Sheba-Melenik Dynasty.
- 3 Quin, E. (1830) *An Historic Atlas containing Maps of the World at 21 Different Periods*, 1st Edition, [Searchworks](#) website, Rumsey Map Center, Stanford University Libraries.
- 4 Quin, Edward (1836) *An Historic Atlas containing Maps of the World at 21 Different Periods*, 2nd Edition, London: Seeley, & Burnside Publishers.
- 5 Roston, M. "We Stared into the Void. It Stared Back" N.Y. Times, 12/24/2019, p. D1.
- 6 Sarna, N.M. (1989) *Torah Commentary, Volumes 1 and 2* Philadelphia, PA: The Jewish Publication Society.
- 7 *The Holy Bible, King James Version, The 1611 the authorized version* (2010) Oxford, U.K.: Oxford University.

# MEET OUR MEMBER

## WALLY JANSEN

The seeds for Wally's life of travels and interest in mapping were planted before he was born. His father built oil refineries for Royal Dutch Shell in various parts of the world, while his mother, accompanying him, made maps of their travels by land, sea, and air, which she shared with her children. Wally was born in Liverpool, England, grew up in Asia and Europe, and attended a Swiss boarding high school before following his educational dream of studying geology, and enrolling at the Colorado School of Mines. During his time there, in the 1960s, continental drift was still being argued, and he made the decision to change majors: geologists, he says, are focused on "looking back." He wanted to "look forward" and changed his major to chemistry.

These were also the early years of computers, and Wally quickly became interested in using computers and his knowledge of chemistry to track the movements of electrons around the nuclei of atoms by producing contours of iso-probability surfaces. There were no computer screens to draw on when he began this work, so he used a plotter. His first degree was a Bachelor of Science in Mineral-Engineering Chemistry, followed by a Masters in Mineral Economics. He was then asked to automate a scanning electron microprobe, and this became the birth of Wally's map-making. He created maps showing the distribution of elements in microscopic metallurgical and geological samples. He graduated from the School of Mines with his new discoveries and a Ph.D. in Applied Chemistry, with a dissertation entitled "Quantitative Elemental Mapping Using the Scanning Electron Microprobe."

While in graduate school, Wally worked for a surveyor who was designing residential subdivisions near ski resorts in the mountains. He had learned surveying while in school and began to design custom software to facilitate surveying and generating maps. Wally also shared some fascinating information that was new to this interviewer: that surveyors had actually mapped the entire United States into rectangular grids, using baselines that run due east and West, and principal meridians that run north and south. Locally, these perpendicular lines are often used to define state borders, the location of roads and highways, and large-scale property boundaries. For example, a "baseline" from the Mississippi River to the West separates Nebraska and Kansas, and is straddled further West by Baseline Road in Boulder Colorado. Six-by-six mile "townships" are measured north and south from the baselines, and contain 36 "sections," each section a mile square.



Wally also created software to analyze alloys with analytical instruments, and in 1977 moved to Idaho, where the US Department of Energy had a number of nuclear power plants upon which experiments were being run to ensure their safety and reliability. He introduced computer automation to a microprobe at the site and was able to draw maps showing the migration of elements at alloy boundaries. After 3 years of enduring the harsh Idaho climate, he moved to the West Coast to join Perkin Elmer, an analytical instrument manufacturer, where, using a scanning Auger microprobe, he applied surface analysis instruments to the hi-tech industry.

Wally then left Perkin Elmer to join Surface Science Labs, designing hardware and writing software for them and then moved on to a company that had a project involving the display of satellite data on computer screens. He developed software for this project, creating maps both on screens and as hard copies. He eventually started his own company, which developed image processing software that could use spectroscopic and time-domain data collected by satellites or aircraft to find minerals, observe and monitor vegetation, and perform multiple other environmental applications. Wally even created a video demonstrating how vegetation changed seasonally around the world over time! Wally marketed his programs worldwide.

An interest in cartography began during his student days at the Colorado School of Mines. At a bookstore in Denver, Wally had purchased his first old leather-bound books, a two-volume set of Virgil's epic poems, the *Bucolics*, the *Aeneid*, and the *Georgics*, printed in 1717. A bookshop in Boulder had supplied a 1536 Parisian *Book of Hours* and a complete 1598 Venetian Ptolemaic atlas by Magini, which contained 26 ancient maps as well as 36 "new" 16th century maps. In these early days of collecting, he had also purchased two of Ortelius' maps of the Netherlands, as well as a map of the Holy Land. Wally has always been very careful about the maps he collects: the bookseller who sold him the Virgil books had told him that he had removed the maps they had contained, in order to sell them independently for a high price, leaving the books of poems with no maps, and greatly reduced values. Wally was very much affected by hearing of this practice and decided then that he would not collect maps or engravings that had been removed from books, a position from which he has never strayed.

Wally is married to Linda and they have three children: Alexander, who is married, recently had a son, and works for Applied Materials in the Bay area, Nanneke, who loves maps and is a life member of the CMS, and Christina, who works in the field of politics in Washington, D.C.

# APPS FOR MAPS

## RESILIENCY MAPS: MAPPING FOR EMERGENCIES

NICOLE MARTINELLI

Anyone who has lived through a major disaster knows that during the first few days afterward, instead of using your smartphone as an extension of your brain, you'll probably have to rely on a personal mental map, which "knows" potential resources and hazards nearby. Where's the closest hospital with disaster care? What about shelters? Gas stations? And how many soft-story buildings — with their propensity to collapse — will you have to zig-zag around to get there?

Trying to answer these questions for myself after moving to San Francisco's rapidly changing South of Market (SOMA) neighborhood was the reason I started the Resiliency Map Project. The Project's goal is to store information about assets, resources, and hazards in a given geographical area on a map that can easily be printed out, and kept where needed for emergencies.

At first glance, a Resiliency Map looks like any standard map — with streets, buildings, bridges and tunnels, some natural features, etc. However, a Resiliency Map also features emergency-related information, such as medical facilities, fire hydrants, cisterns, shelters, construction sites, community meeting places, car repair shops, groceries, and other emergency information. These can be essential in enabling navigation through an area after disaster strikes. Resiliency Maps can also be used after a disaster to track damage.



Map produced using QGIS, a free, open-source cross-platform desktop geographic system.

### The bounce back

Resilience is essential to life, never more so than in a time of emergency. It can be defined as the ability to "bounce back" —

to recover, or to adapt, to a major change that has caused stress, disorientation, a sense of helplessness or defeat, and an inability to cope. Resilience enables a person to function, often better and with greater capacity than before the disaster occurred. It is an important quality each of us can cultivate, and is essential for effectively surviving disasters of all kinds.

The concept of resilience has never been more important or more urgent than it is now. In 2018, 315 disaster events killed more than 11,804 people, affected over 68 million people, and tallied \$131.7 billion in economic losses worldwide, according to the Centre for Research on the Epidemiology of Disasters (CRED). Climate change, weak governance, and an increasing concentration of people and assets in areas exposed to hazards are driving disaster risks upwards, according to the United Nations Development Programme. The ability to adapt, act, and spring back is essential, and knowing an area's resources and dangers prior to an emergency can help save lives, as well as reduce injuries and property damage.

### Getting prepped

Like many Californians, you probably already have an emergency kit. (If not, get started with the link below!) Perhaps, like me, you've also taken



Emergency Response training session

a course in Community Emergency Response Training (CERT) or NERT, Neighborhood Emergency Response Training. In addition to basic triage and safety, these programs also teach you to look at your surroundings carefully, from identifying unreinforced masonry buildings, to spotting which hydrants carry potable water, and stress the value of including a map as part of your 72-hour emergency kit. But what kind of map has CERT or NERT information, essential in emergencies, on it?

*Confession:* before moving to the SOMA, my emergency kit contained a crumpled paper tourist-board map. That's better than nothing, but is of little help in negotiating, for example, a safe route to a specific gathering point, which isn't even pictured on the map.

### The wide world of Open Source

Good ideas tend to get around. Before I began the Resiliency Maps Project, a number of people had already sketched out these kinds of maps using various tools, ranging from pen and paper to Apple and Google maps. In using these maps, prob-

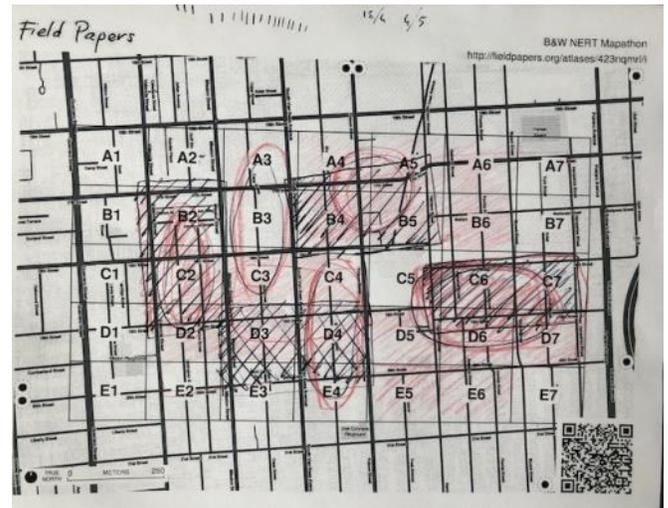
lems quickly arose. For starters, tools from these companies rarely helped map more than one neighborhood at a time. A group of motivated volunteers would make a big push to map their surroundings, and then? One neighborhood mapped, and no more. And, crucially, because of the pay-to-play nature of the tools themselves, the groups who had created these resources sometimes found themselves without access to their own work, which had often been years in the making, once the companies started charging for access.

The Resiliency Map Project contributes to, and is powered by OpenStreetMap, an editable map of the world, supported by the not-for-profit OpenStreetMap Foundation. Often called the “Wikipedia of Maps,” anyone can contribute to OpenStreetMap, and the community offers a number of tools to assist users in creating accurate and useful maps.

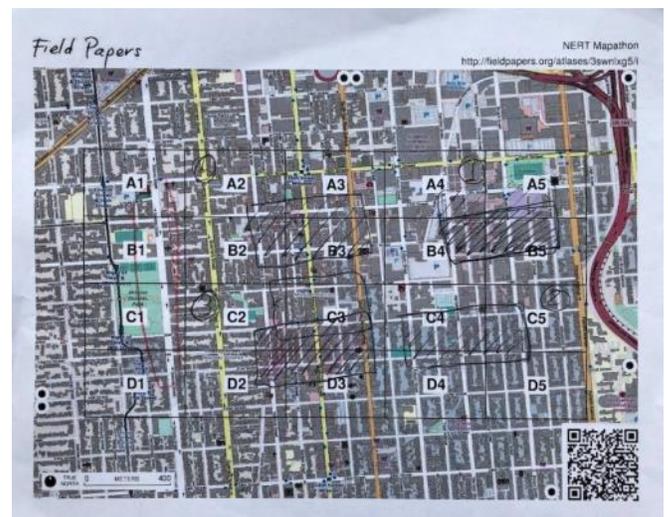
Preparedness is a shared responsibility. Using OpenStreetMap, Resiliency Maps can be added to, or edited by, people across an entire city to provide information specific to where they live, work, or go to school. The crowdsourced nature of the project means that a stable group of technical administrators, or a single group of committed volunteers, isn’t required for development or maintenance. The entire toolkit for the project is open source, ensuring that the maps produced will be available to anyone who wants to use them, and never subject to the bottom line of a for-profit company.

**Mapping it out**

The Resiliency Map Project is just getting started, but a few milestones have already been achieved. In addition to my presentation of the project at the OpenStreetMap’s State of the Map Conference, and my participation in the Forum on Disaster Risk Reduction ([EFDRR](#)), about 50 people have contributed to the project through volunteering for “Mapathons”.



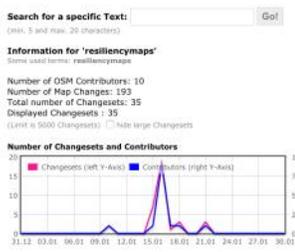
*NERT Mapathon field paper*



*NERT Mapathon field paper*

The ideal Resiliency Map Project volunteer is interested in resilience preparation, and sees the need for maps as an essential tool. That’s it. There are a ton of tools and ways that people can contribute — pen and paper, apps, and code are just three of these.

**OSM Changesets of the last 30 Days filtered by 'resiliencymaps'**



*Resiliency Map coverage displayed in OpenStreetMap (South of Market Area, San Francisco)*

The first Resiliency Map Mapathon in California was a two-hour session with NERT (San Francisco’s version of CERT), using Field Papers for mapping. Field Papers is an excellent way to get a group mapping with OpenStreetMap, without requiring a lot of computer time. An area to map is selected, and copies of a map of the area are printed out. Group members walk around their area with the paper copies,

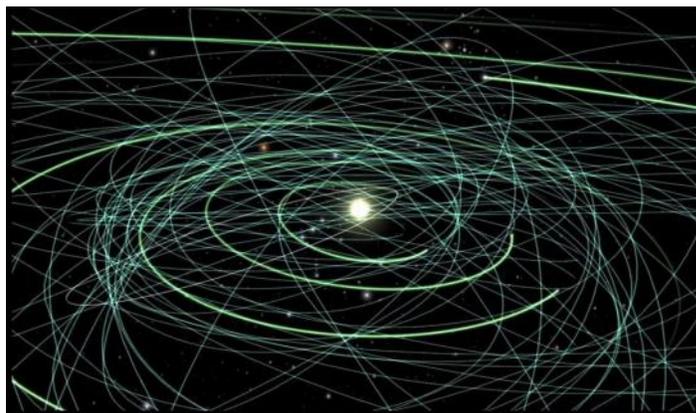
*continued at RESILIENCY, page 23*

# MAPPING ASTEROIDS

BY JULIET ROTHMAN

**D**r. Ed Lu, an astronaut for 12 years, and currently the Director of the Asteroid Institute, was the guest speaker at the Rumsey Map Library on December 6<sup>th</sup>. His presentation, *Charting the High Frontier of Space*, explored the process of mapping asteroids and some of the challenges and possibilities of engaging in this process.

Dr. Lu noted that mapping has always accompanied the opening of new frontiers, in global exploration, in the sciences, and in technology. Space, he believes, is the next frontier, providing opportunity for the development of science, commerce, and defense. The space economy is currently \$350 billion and is growing at a rate that is 5% faster than the global economy. If trends continue, the space economy will be larger than that of the earth by the end of the century. The actual costs of space launches are decreasing, as are the costs of building spacecraft.



*Mapped orbits of selected asteroids*

an enormous number, all in motion, all affected by various factors. The earth also moves, at an approximate speed of 70,000 miles per hour. It is essential that maps be able to reflect where things are presently, and where they will be at a designated future time.

Another important aspect of mapping asteroids to consider is commercial. Sudbury, Canada is the location of one of the largest asteroids to hit earth. The asteroid was composed of iron and nickel, and is the site of one of the world's largest mines. Asteroids which can be used commercially necessitate resource mapping, similar to our processes for mining claims. Commercial use of asteroids involves investment in infrastructure as well, but companies will be unwilling to make these investments without guarantees that their claim will be respected. Dr. Lu suggested that there was a need for the development of digital claims maps of asteroids.

Another important element is fear. Asteroids can hit earth and cause a great deal of damage from explosive energy. Mapping asteroids in four dimensions can provide advance information of asteroid strikes, so that they can be deflected and their trajectory altered. The technology currently exists—but cannot be deployed at the last minute: advance planning is required, and this can be achieved with asteroid mapping.

Mapping asteroids requires calculation of orbits, addressing gravity and corrections to gravity, as well as the effects of rotation. This can be done for single asteroids today, Dr. Lu says—but can it be done for millions of them? This is challenging, but he believes that it is beginning to be possible. A “map” is currently being built – but a “map” of asteroids is really more than a map: it is a “service” which requires continuous observations and updating. It alters the definition of “maps”—as *services* rather than as artifacts.



*Dr. Lu's animated video of orbiting asteroids*

Maps of the heavens are not new: they have been found on cave walls and ancient artifacts. There are star charts that are thousands of years old. Mapping the space frontier today is necessary—and the mapping of smaller space objects such as asteroids is very important. Dr. Lu outlined some important factors to consider in developing these maps.

Mapping space and all of the objects in space is an essential component of scientific study, as well as serving our innate curiosity. Previous maps, in two or three dimensions, however, have been static. While these have been useful, it is essential to note that that the solar system is NOT static: it is in motion. This necessitates mapping in four dimensions plus one—TIME. Images of the asteroids in the solar system show

# FOUR HUNDRED YEARS OF MAPPING AND NAMING THE MOON

ROBERT A. GARFINKLE, FRAS

For centuries humankind has endeavored to create maps and charts to display the local environment, town, country, empire, and/or the then-known world. We also love to give names to almost everything shown on the maps. In the case of our nearest celestial neighbor, the earliest extant naturalistic drawings may be the image of the waning gibbous Moon in the background of Dutch master Jan van Eyck's (c. 1385–1441) c. 1420–30 painting of the Crucifixion, (Fig. 1), and Leonardo da Vinci (1452–1519)'s sketches in his 16th-century notebooks (Fig. 2). Both of these rough drawings did not include any names for the surface features. Refer to Volume 2019, Issue 2 of this journal, for a discussion on da Vinci's terrestrial mapping works.

The detailed mapping and naming of lunar features commenced sometime shortly before the year 1603, when British doctor William Gilbert of Colchester (1544–1603) drew a map of the Moon, and for the first time placed names on the lunar features he was able to see without the aid of an optical instrument (Fig. 3, next page). None of Gilbert's names survive as part of our current lunar nomenclature. Unlike later lunar cartographers, Gilbert considered the dark areas to be land, and the highlands to be bodies of water (Latin: *mare*; plural *maria*). Gilbert was also a physician to Queen Elizabeth I (1533–1603).

With the invention of the telescope in 1608, the effort to create maps of the Moon grew in both possibility and importance. In the following year, British scientist Thomas Harriot (1560–1621) appears to have been the first to aim a telescope at the Moon and draw charts of what he observed (Fig. 4, next page). He did not include any names on his drawings, but in July 1611 he made a map of the full moon and numbered 49 features (Fig. 5, next page). Unfortunately, the record of what the numbers represented is lost, and his lunar drawings themselves were not published until 1965.

Italian scientist and teacher Galileo Galilei (1564–1642) observed the Moon and published his first renditions of it in

his landmark book *Sidereus nuncius* (1610), but he did not name any of the features. During the next couple of centuries,

additional observers made rough sketches of the Moon that were published and re-published in several books and encyclopedias. Most of these

maps also did not contain feature names.

In 1644, Michael Florent van Langren [a.k.a. Langrenus (1600–75)] created a manuscript lunar map, on which he

placed names for many of the features. The next year he published a revised map, which became the basis for our modern lunar nomenclature (Fig. 6, next page). He used a mixture of personal and place names. A few of Langrenus' names have continued to be used, but only three of them, Pythagoras, Endymion, and his own, Langrenus, remain as names for the craters where he applied them.

Johan Höwelcke, [a.k.a. Johannes Hevelius, Johann Hewel, or Johann Hewlecke (1611–87)] was a brewer in Danzig, Poland. He built an observatory on the roof of his home, and, in 1647, published *Selenographia: Sive, Lunæ Descriptio*. He was the first to show the areas of the Moon that are visible only during librations in longitude and latitude. Hevelius included a nomenclature completely different from that of Langrenus, using only names of terrestrial features (Fig. 7, next page).

The Italian Jesuit astronomer and selenographer Giovanni Battista Riccioli [a.k.a. Ioanne Baptista Ricciolo, or Gaimbastia Riccioli (1598–1671)] published his 2-volume work *Almagestum novum* in 1651. He named over 400 nearside features on a detailed drawing of the full moon made by his friend Francisco Maria Grimaldi (1618–63)

(Figure 8). Most of Riccioli's names remain where he applied them. In following the Roman Church's geocentric theory of the Universe, Riccioli fervently opposed the Copernican helio-



Fig. 1



Fig. 2



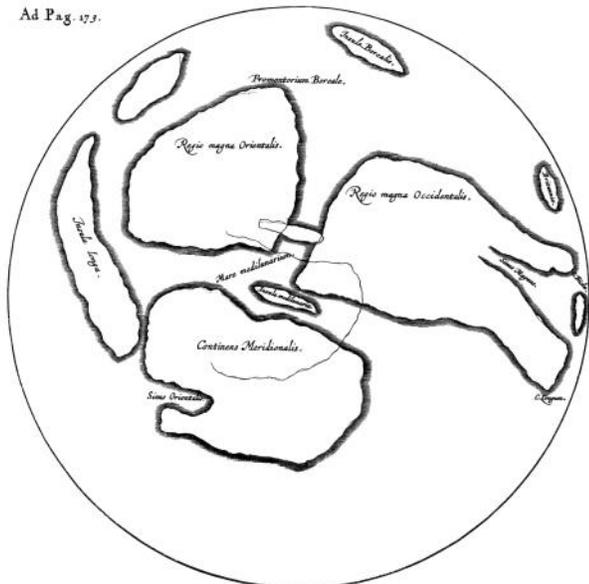


Fig. 3 William Gilbert of Colchester map of the Moon

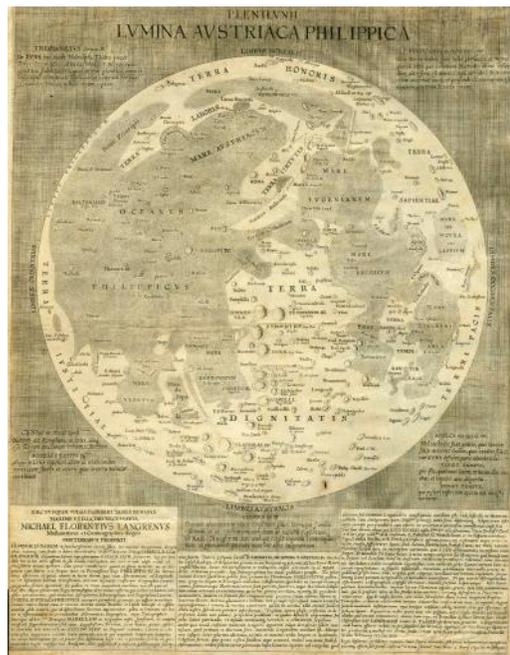


Fig. 6 'Langrenus' manuscript lunar map

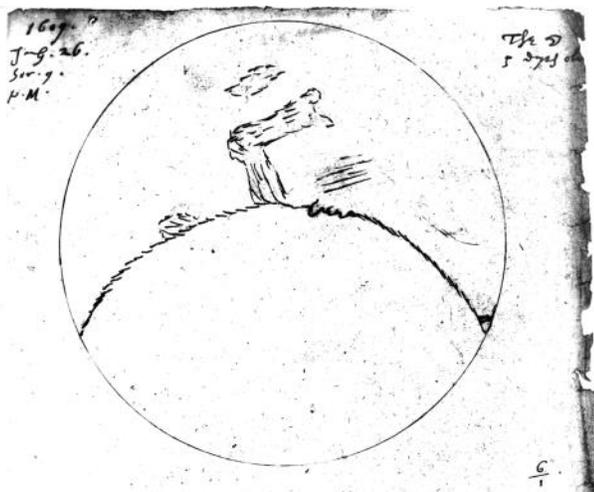


Fig. 4 Thomas Harriot Moon chart

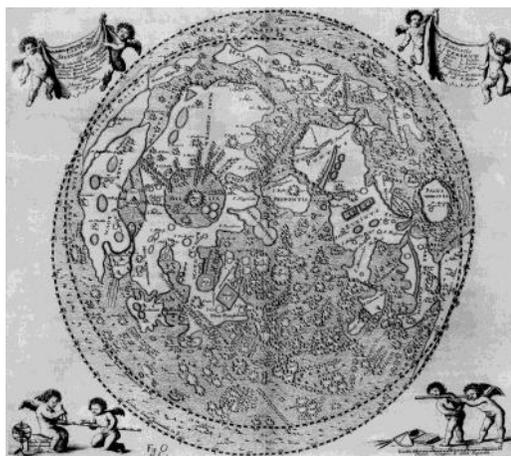


Fig. 7 Johan Höwelcke, from Selenographia: Sive, Luna Descriptio

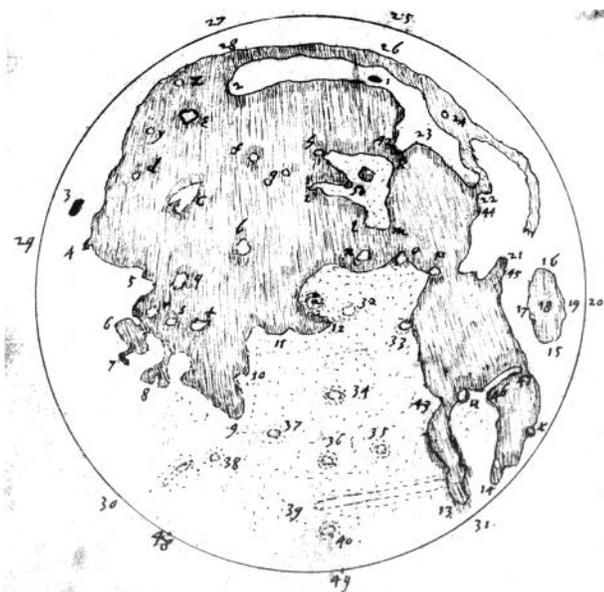


Fig. 5 Thomas Harriot Moon chart with 49 features



Fig. 8 Giovanni Battista Riccioli, 400 lunar features

centric theory in his books, yet, interestingly, he named the most prominent lunar crater for Mikolaj Kopernik [a.k.a. Nicolaus Copernicus (1473–1543)]! He named the white albedo patch, which is now known as Reiner gamma, for Galileo, and wrote that he was flinging the heretic and his heliocentric ideas into Oceanus Procellarum, where they hoped that they would drown. At that time, astronomers still thought that the dark areas on the lunar surface were bodies of water (mare).

In 1791, the German selenographer Johann Hieronymus Schröter (1745–1816) published the first volume of his two-volume set, entitled *Selenotopographische Fragmente sur genauern Kenntniss der Mondfläche*. The second volume, published in 1802, contains the earliest detailed descriptions and drawings of lunar features (Fig. 9). He intended to produce a full map of the Moon, but the war with France ended that project when Napoleon's soldiers destroyed Schröter's observatory and papers, and then dismantled his telescope thinking that the brass parts were made of gold.

The German cartographer Wilhelm Gotthelf Lohrmann (1796–1840) planned to produce a complete map of the full moon, but was able to complete and publish only 4 of his planned 25 sections, in 1824, before his eyesight failed (Fig. 10). The balance of his charts was completed and published in 1878, in a portfolio by the German-born Greek astronomer Johann Friedrich Julius Schmidt, [a.k.a. Schmidt of Athens (1825–84)]. Also, in 1878, Schmidt published his own portfolio set of 25 charts (Fig. 11) that included a companion book, *Erläuterungsband* ("Explanatory Volume"), which gives detailed information on about 33,000 lunar nearside features.

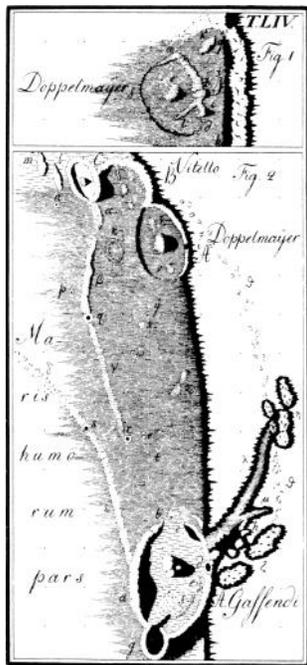


Fig. 9

The most influential lunar map of the full moon in the 19th century, *Mappa Selenographica* (Fig. 12), was published in 4 sections between 1834–36 by German banker Wilhelm Beer (1797–1850) and astronomer Johann Heinrich Mädler (1794–1874). In addition, they also published their 412-page descriptive lunar guidebook *Der Mond* in 1837.

In 1910, British selenographer Walter Goodacre (1856–1938) published his orthographic lunar map portfolio (Fig.

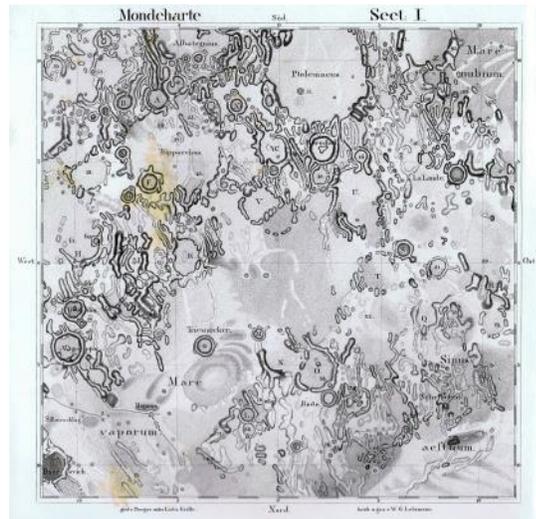


Fig. 10



Fig. 11

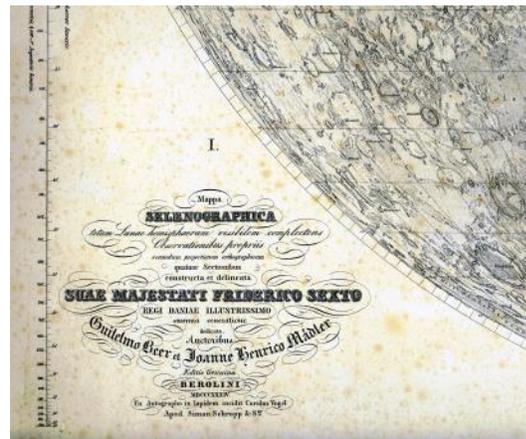


Fig. 12

13), followed in 1931 with his self-published book, *The Moon: With a Description of Its Surface Formations*. Goodacre served as the Director of the British Astronomical Association's (BAA) Lunar Section for over 40 years.

Chaos ruled the lunar nomenclature list during the 18th and 19th centuries, as each lunar map maker applied his own set of names to lunar features. In far too many cases, different names

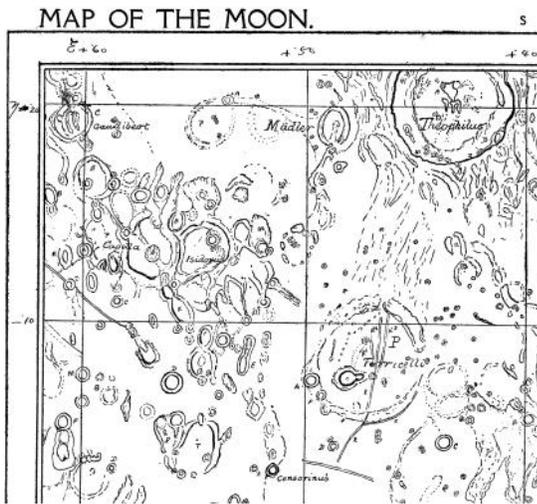


Fig. 13

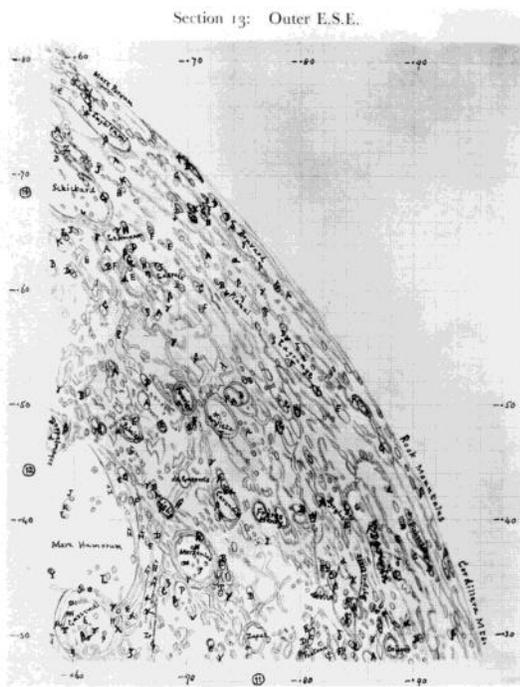


Fig. 14

were used for the same feature, or a specific name was used for two or more different features. One of the reasons for the formation of the International Astronomical Union (IAU), in 1919, was to create a unified, official, lunar nomenclature list and lunar charts. In 1932, the IAU adopted a list of names, and three years later published the list and charts in 2 volumes entitled *Named Lunar Formations* (Fig. 14). All names to be added to that original official list must first be approved by the General Assembly of the IAU.

From 1924 until shortly before his death in 1960, British selenographer Hugh Percy Wilkins (1896–1960) produced

four versions of full moon lunar maps of varying diameters, with the last one measuring 300 inches (7.2 m) across (Figures 15 and 16). Wilkins added 107 new names on his maps, of which the IAU adopted only a few as official names. He also crowded his charts with a jumble of non-existent features and misaligned lines of orthographic coordinates, which made them very challenging to use. His charts were the last amateur lunar maps to use the orthographic coordinate system.



Fig. 15

During the early years of the Space Age (1960s and 70s,) the National Aeronautical and Space Administration (NASA) had a series of paper maps of the moon, which used selenographic latitude and longitude coordinates, and were produced based on the images taken of the lunar sur-

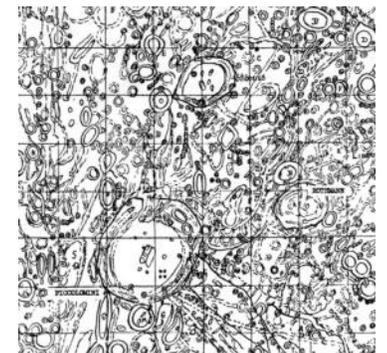


Fig. 16

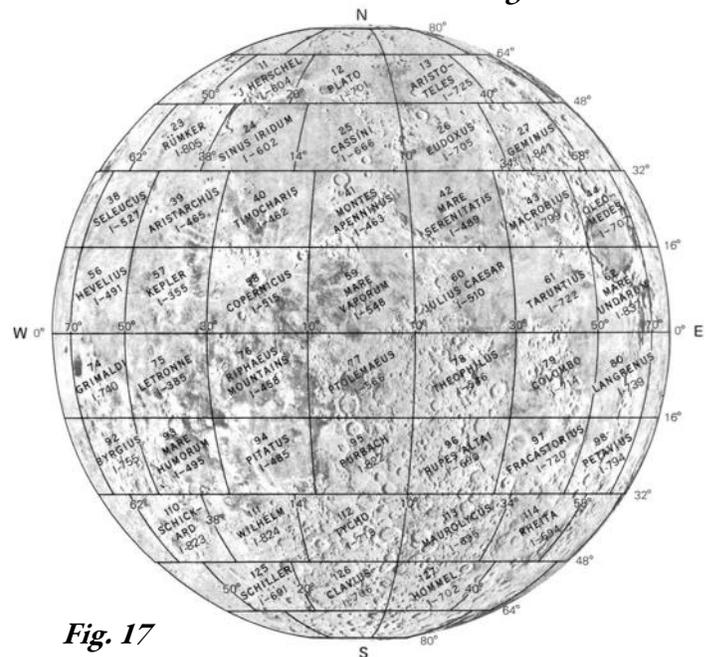


Fig. 17

INDEX OF 1:1,000,000-SCALE MAPPING OF THE MEAN EARTH-SIDE HEMISPHERE OF THE MOON

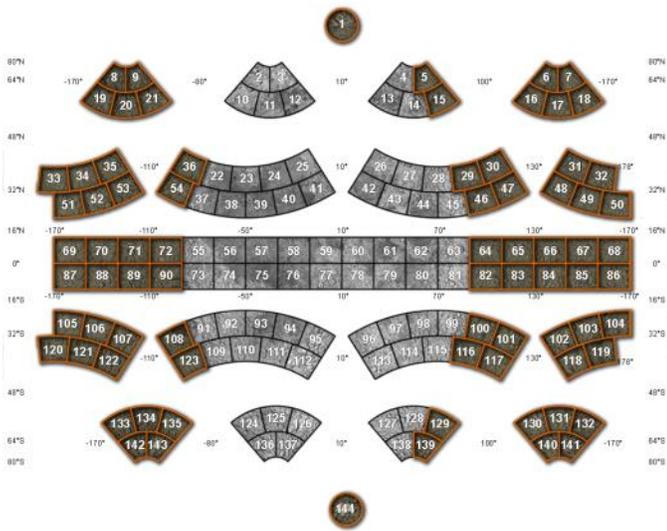


Fig. 18

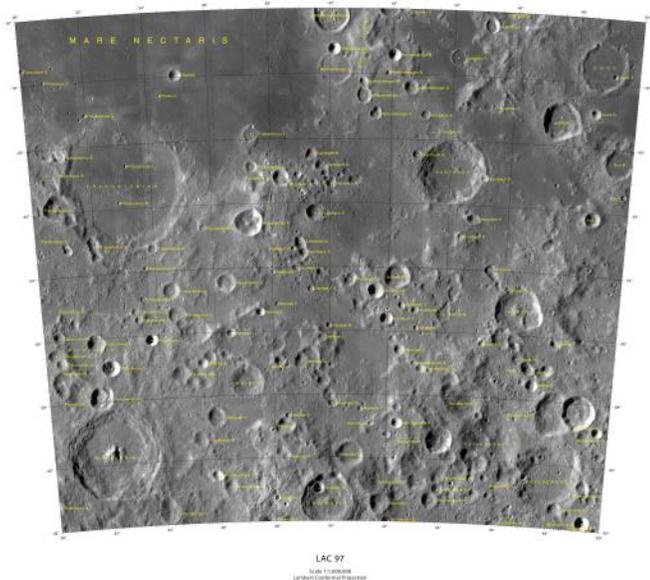


Fig. 19

face by the Lunar Orbiter spacecraft. Figure 17 (prior page) is the Index Map for these paper Lunar Astronautical/ Aeronautical Chart (LAC) maps, which were used in planning operations for the Apollo landings. These maps were simply artists' renderings of the Orbiter photographs and contained numerous inaccuracies. Maps were planned for lunar limb areas, the edges of the Moon's disk as seen from Earth, but were never produced.. The Orbiters also failed to photograph a large area of the Moon's south polar region.

On June 18, 2009, NASA launched the *Lunar Reconnaissance Orbiter* (LRO) to digitally image the entire lunar surface from its polar orbit. The LRO is still in orbit around the Moon. In 2012, the set of electronic maps of the entire lunar globe, based on the LRO images were released, which super-

seded the Orbiter paper editions. Figure 18 is the Index Map for the electronic version of the lunar maps, and Figure 19 is LAC chart 97 of this series. These electronic maps are at the United States Geological Survey (USGS) in Flagstaff, and their website may be accessed at: <https://planetarynames.wr.usgs.gov>. The Flagstaff office maintains the database for the IAU's Solar System "Gazetteer of Planetary Nomenclature." The LRO images were also put together as a mosaic of the entire lunar globe, and are included in the Google Earth Pro program. Google Earth includes Google Mars and the celestial sphere (<https://www.google.com/earth/>).

From the first crude, hand-drawn attempts to map the Moon, approximately 400 years ago, we have arrived at a digital technology level where we can now study even small features [less than 1 mile (1.6 km) in diameter], including the Apollo and Luna landing sites that had been generally unobservable, either live through telescopes or photographically in years past.

### References

Beer, Wilhelm and Johann Heinrich Mädler (1834–36) *Mappa Selenographica*. Berlin: Simon Schropp and Company.  
 ———. (1837) *Der Mond*. Berlin: Verlag von Simon Schropp and Company.

Blagg, Mary A. and Karl Müller (1935) *Named Lunar Formations: Volume I, Catalogue*. London: Percy Lund, Humphries and Company.

Blagg, Mary, Karl Müller, and William Henry Westley (1935) *Named Lunar Formations: Volume II, Maps*. London: Percy Lund, Humphries and Company.

Galilei, Galileo (1899) *Sidereus Nuncius or the Sidereal Messenger*. Trans. Albert Van Helden. Chicago: Chicago Univ. Press.

Gilbert, William (1651) *De Mundo nostro Sublunari Philosophia Nova*. Amsterdam: Apud Ludovicum Elzevirium. Facsimile reprint by Menno Hertzberger and Company, c. 1951.

Goodacre, Walter (1910) *A Map of the Moon in XXV Sections*. London: W. Goodacre.

———. (1931) *The Moon: With a Description of Its Surface Formations*. Bournemouth, England: Printed for the Author by Pardy and Son.

Hevelius, Johannes (1647) *Selenographia: Sive, Luna Descriptio*. Edited by H. von Lambrech. Leipzig, GDR: Edition Leipzig, 1967. A facsimile copy of the original Gedani Latin edition.

Lohrmann, Wilhelm Gotthelf (1824) *Topographie Der Sichtbaren Mondoberflaeche: Erste Abtheilung Mit Vi Kuppertafeln*. Leipzig: Johann Friedrich Hartknoch.

———. (1878) *Mondkarte in 25 Sektionen*, 2nd ed. Reproduction of Lohrmann's lunar charts as published by Julius Schmidt. Reproduction by Paul Ahnert, Leipzig: Johann Ambrosius Barth, 1963.

Riccioli, Giovanni Battista (1651) *Almagestum novum astronomiam....* Bologna: Ex Typographia Hærdis Victorii Benatii. (Commonly referred to as the "New Almagest.")

———. (1665) *Astronomiæ reformatæ tomi duo....* Bologna: Ex Typographia Hærdis Victorii Benatii.

Schmidt, J. F. Julius (1878) *Charte der Gebirge des Mondes, Nach Eigenen Beobachtungen in den Jahren 1840–1874*. Berlin: In Commission bei Dietrich Reimer.

Schröter, Johann Hieronymus (1791, 1802) *Selenotopographische Fragmente....* 2 vols. Lilienthal: Carl Gottfr. Fleckeisen.

Whitaker, Ewen Adair (1999) *Mapping and Naming the Moon*. Cambridge: Cambridge Univ. Press.

Wilkins, Hugh Percy (1960) *Moon Maps: With a Chart Showing the Other Side of the Moon Based Upon the Soviet Photographs*. New York: MacMillan Company.

**Robert A. Garfinkle, FRAS** is considered an independent scholar on the history of astronomy. He is the author of the international best-selling book *Star-Hopping: Your visa to Viewing the Universe* (Cambridge Univ. Press, 1994, 1997) and a co-author of *Advanced Skywatching* (The Nature Company, Time-Life Books, 1997). His latest book is the 3-volume set, entitled *Luna Cognita* (Springer, 2020). Mr. Garfinkle is also the Book Review editor for the "Journal of the Association of Lunar and Planetary Observers" (JALPO) and the Historian for the Lunar Section of the BAA. He owns an extensive collection of lunar books, maps, charts, and photographs.

*RESILIENCY, continued from page 16*

and mark what they see onto their map. The maps are then combined into one "master" map, and then scanned or photographed with the QR code. The resulting map can then be added as a layer to OpenStreetMaps. During the first Mapathon, teams of three or four people made a mad dash around SOMA on a Saturday morning, updating construction sites, adding hydrants and fire call boxes, and jotting down hazard diamonds and other essentials.

The second Mapathon was completely digital: MaptimeSF, a global meetup group focused on making maps, talking about maps, and geeking out on all things techy and spatial, hosted the Resiliency Map Project. There were about 25 of us, including GIS students new to OpenStreetMaps, as well as a core group of Maptimers already well acquainted with the platform. This time we used Mapillary, a startup that provides ground-level imagery which is integrated into OpenStreetMaps. Participants used the images to verify as well as add additional points on the map, making about 230 changes in less than two hours. At 4AM the next day, a 3.4 quake, centered in Oakland, shook the Bay Area awake: a somewhat gentle reminder of the importance of addressing these issues, and creating complete Resiliency Maps!

### Get involved

The goal of the Resiliency Maps Project is to build a replicable process that anyone can use to build their own maps. It takes just a simple step to begin, and to engage with the potential future needs of your family and your community in this way. On the Resilience Map Project website, you'll find tutorials for making maps with pencil and paper, smartphone apps, as well as written tutorials you can try out.

Unfortunately, disasters will just keep coming — but we can prepare ourselves with the knowledge and information that will enable and support our own personal resilience!

### References:

[www.resiliencymaps.org](http://www.resiliencymaps.org) (mailing list and tutorials)

Twitter @resiliencymaps

Disaster risk reduction stats <http://www.undp.org/content/undp/en/home/climate-and-disaster-resilience/disaster-risk-reduction.html>

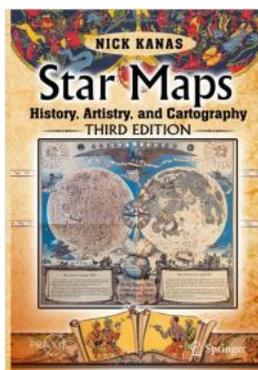
Emergency kit prep <https://www.sf72.org/>

NERT: <https://sf-fire.org/neighborhood-emergency-response-team-nert>

CERT: <https://www.ready.gov/community-emergency-response-team>

<http://maptime.io/>

## BOOK REVIEW



*Star Maps: History, Artistry, and Cartography, 3rd Edition*, Nick Kanas, M.D.

ISBN-13: 978-3030136123,

Springer Praxis Books, 563

pages, hardcover.

Amazon: \$45.00

REVIEWED BY JONATHAN CROWE

Celestial maps are lovely things. From the unalloyed beauty and artistry of Renaissance star atlases and Coronelli's globes to the precision of Wil Tirion's modern-day *Uranometria*, the iconic *National Geographic* hemispheric map of the moon, and Eleanor Lutz's indescribable *Atlas of Space*, maps of constellations and planets are worth the attention of every map enthusiast. So why don't they get more attention than they do? There was a time when knowing the constellations and paths of the planets was an essential part of navigation, but technological advances have made that a thing of the past.<sup>1</sup> Nor have scholars of map history paid celestial maps much attention.<sup>2</sup> By and large the people most interested in celestial maps are the people interested in astronomy: professional and amateur astronomers and other space enthusiasts.

Such was the case with me: astronomy and cartography were two interests that found something in common with celestial maps. On my map blog, The Map Room, I share links to them every chance I get, though my website stats show that they're less popular. And such was the case with Nick Kanas, a retired psychiatry professor, lifelong amateur astronomer, and celestial map collector. His *Star Maps: History, Artistry, and Cartography* was first published by Springer Praxis in 2007. It's now in its third edition, which came out last year, for the first time in hardcover, and now with illustrations in color throughout the text.

At first glance *Star Maps* is thorough. Possibly *too* thorough. Kanas has not so much written a history of celestial mapping as assembled a compendium. Meticulously catalogued (chapters and sections are numbered, e.g. "10.2.3.1 Norton's *Star Atlas*"), *Star Maps* gives catholic attention to all kinds of celestial maps and related ephemera. While Kanas dedicates a chapter to the "big four" of Renaissance celestial mapmakers—Bayer, Hevelius, Flamsteed and Bode—he does not limit his focus to them, covering their contemporaries, derivatives,

antecedents and successors from ancient times to the present day. If it's a map of the stars, or of the planets, or something even remotely related—a chapter on special topics covers celestial globes, astronomical instruments, lunar and planetary maps and, curiously, book frontispieces—it's almost certainly included in this book. This is even more true in the third edition, which adds a chapter on pictorial maps (heavily influenced by Hornsby's *Picturing America*<sup>3</sup>) and celestial images in paintings, whose connection to his remit is tangential at best. (It's like a book about railroad maps that also talks a lot about timetables.) *Star Maps* bulges and swells as more is added with each new edition: the third edition is 181 pages longer than the first.

It's important to remember a book's target audience—its imagined ideal reader. In the case of *Star Maps* this is Kanas's younger self, who came to map collecting via his lifelong interest in amateur astronomy. "I was frustrated that there was not a single book on celestial cartography that could inform me about the various aspects of my collecting," he writes in the preface to the first edition. "What I needed was a book that not only was a primer for the collector but also had sufficient reference detail to allow me to identify and understand my maps. Nothing like this appeared, so I decided to write such a book some day" (p. xxi). In other words, for a compendium this is a surprisingly *personal* book, one that reflects his own journey into the subject and, presumably, his interests as a collector.

Despite the enthusiasm for maps and amateur astronomy I share with Kanas (mine is a three-telescope household), I have to confess that I'm not his ideal reader. I have a background in the history of science, so I didn't require the 150-page history of astronomy that begins *Star Maps*. Other readers will appreciate those opening chapters, though they're by no means the definitive take on the subject, because it's important to ground the history of these maps in the observations and discoveries that produced them. *Star Maps* is written to get the aspiring celestial map enthusiast up to speed from a standing start, with no prior knowledge.

Nor have I fallen into map collecting, whereas Kanas has collected celestial maps for decades. This also affects *Star Maps*'s gaze, not just in terms of the appendices that discuss aspects of celestial map collecting, but in terms of the text's close focus on the maps themselves, which are frequently described in terms of their beauty, popularity or rarity—qualities that are of more interest to collectors than to historians. Because my background is in history, my preference is for perspective and context, rather than detail, so my favorite chapter of the book

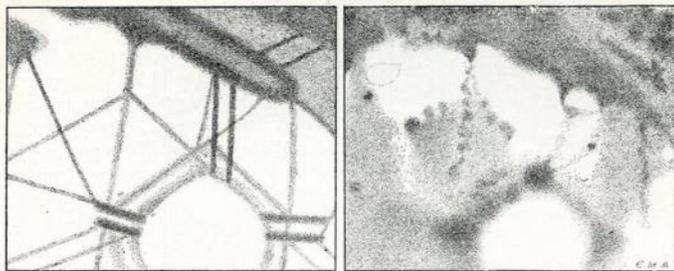
*continued at BOOK REVIEW, page 29*



annoyed Schiaparelli. In 1906, Lowell published a popular book, *Mars and Its Canals*, proposing that the canals served to transport water from the poles to the planet's more arid central plains. Fig. 2 shows a Lowell road map of Mars, dating to Mars' opposition of 1903.[5]

However, other observers disputed the notion of canals. Edward Emerson Barnard reported that he found no evidence of canals on Mars. The British naturalist Alfred Russel Wallace published *Is Mars Habitable?*, a book that severely criticized Lowell's claims. Wallace showed that Mars was almost certainly much colder than Lowell's estimates, and that the atmospheric pressure was too low for liquid water to exist. He concluded that complex life was impossible, let alone the irrigation system claimed by Lowell.

Eugène Antoniadi, initially a supporter of Lowell, observed Mars with the largest telescope in Europe. In moments of good visibility he could see the supposed "canals" were, in



**Fig. 3** Lowell's map compared to Antoniadi's observation

Source: <https://artsandculture.google.com/exhibit/4ALy3KSjVtBnJw>

fact, myriads of discrete features. Fig. 3 contrasts Lowell's drawing with Antoniadi's observation. Edward Maunder also demonstrated that when a poor-quality telescope views many point-like features, they appear to join up to form lines.[6]

The early tools for observation were primitive by today's standards. Early astronomical observations were made without photography. Astronomers had to stare for hours through their telescopes, waiting for a moment of still air when the image was clear, and then draw a picture of what they had seen. This resulted in poor quality, sometimes misleading, maps.

The March 2019 issue of *Calafia* included an article entitled "When Mars had Canals." [7] This was an excerpt from the book *All Over the Map: A Cartographic Journey*, by Betsy Mason and Greg Miller. The excerpt briefly summarizes how Mars "canals" came to be and were eventually debunked.

### Modern mapping of Mars

Accurate topographic maps of planets, their moons and asteroids require an observation precision not available until recently. Distances from objects in space, such as between the Earth and the Moon, were done by Aristarchus of Samos, and later Hipparchus. Their measurement was 233,000–265,000 miles, a remarkably accurate result.

*But Mars is much further away from Earth than the Moon.* Parallax can be used to estimate the Earth-Mars distance but is useless to give vertical topographic measurements, such as the height of mountains or the depth of canyons. This was overcome by using a laser altimeter on a satellite orbiting Mars.

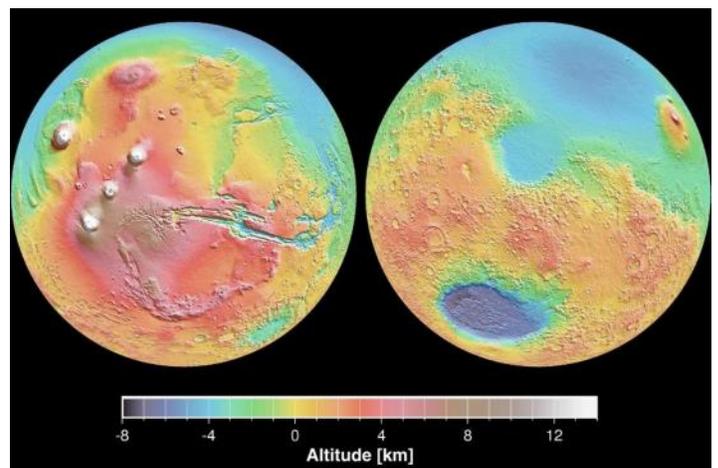
The Mars Orbiter Laser Altimeter (MOLA) was an instrument on the Mars Global Surveyor, which orbited Mars from September 1997 to November 2006. Until June 2001, MOLA transmitted infrared laser pulses toward Mars and captured the pulse's return. The time of flight was used to calculate the distance to the surface. The pulse time allowed the construction of a detailed, accurate, topographic map.

### A few standout topographical features

Fig. 4 is a USGS false-color topographic map of Mars. Elevations are color-coded, in the order from lowest to highest being blue-green-yellow-orange-red-white. The accuracy uncertainty is tiny:  $\pm 3$  meters ( $\pm 10$  feet).

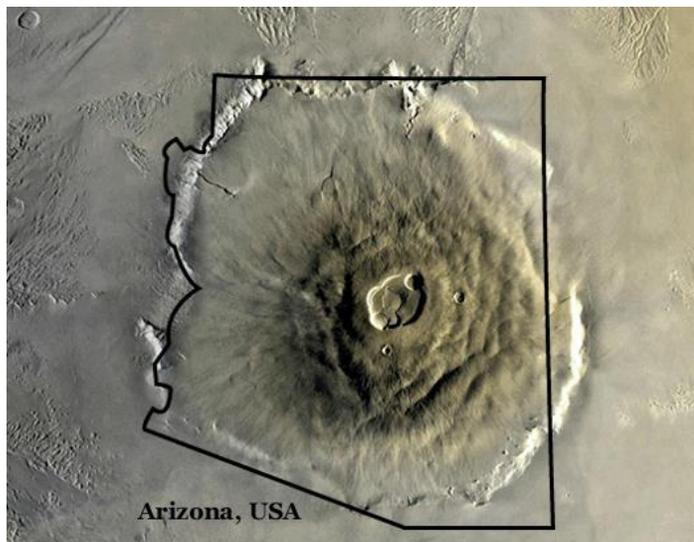
The deep blue circular feature is Hellas Planitia, an enormous impact basin. Its diameter of 1,400 miles (2,250 kilometers) makes it one of the largest basins in the solar system.

The four white features in the image at left are large shield volcanoes. The largest, Olympus Mons (upper left) is the largest



**Fig. 4** USGS Mars topography map Source: <https://www.jpl.nasa.gov/spaceimages/details.php?id=PIA02820>

known volcano in the solar system. It is 624 kilometers (374 miles) in diameter and 25 kilometers (16 miles) high. Fig. 5 shows it superimposed on a map of Arizona. The volume of

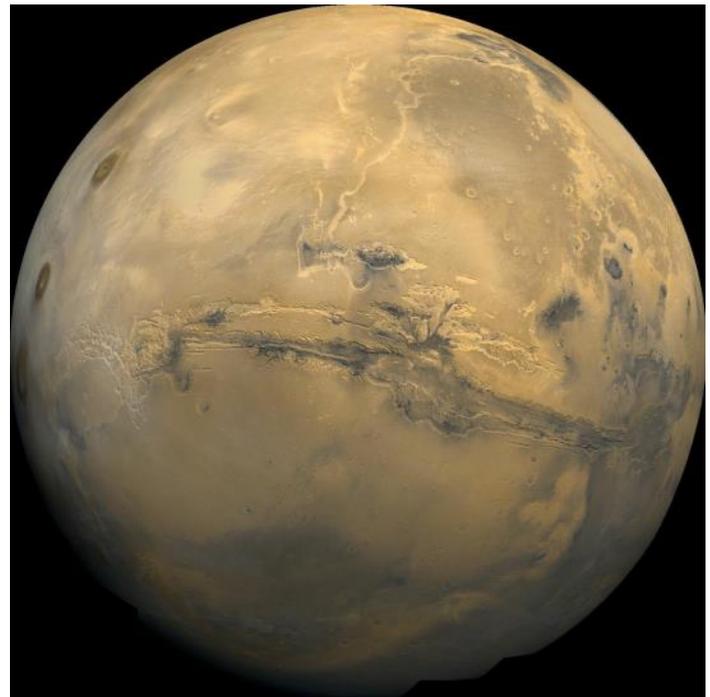


**Fig. 5** Olympus Mons compared to Arizona  
 Source: <https://mars.jpl.nasa.gov/gallery/atlas/olympus-mons.html>

Olympus Mons is about 100 times larger than that of Mauna Loa, the largest volcano on Earth.

Another way to fully appreciate the enormity of Olympus Mons is to compare it to other features on Earth. Figure 6 compares a side view with Mount Everest and Mauna Kea, another very large Hawaiian volcano. The units are in meters. In feet, Olympus Mons is 69,648 tall, compared to Everest's 29,028 feet, and Mauna Kea's 13,802 feet.

Another striking feature on Mars is Valles Marineris, an enormous canyon over 3,000 kilometers (1860 miles) long. It spans as much as 600 kilometers (370 miles) across and is as much as 8 kilometers (13 miles) deep. By comparison, the Earth's Grand Canyon is 800 kilometers (500 miles) long, 30



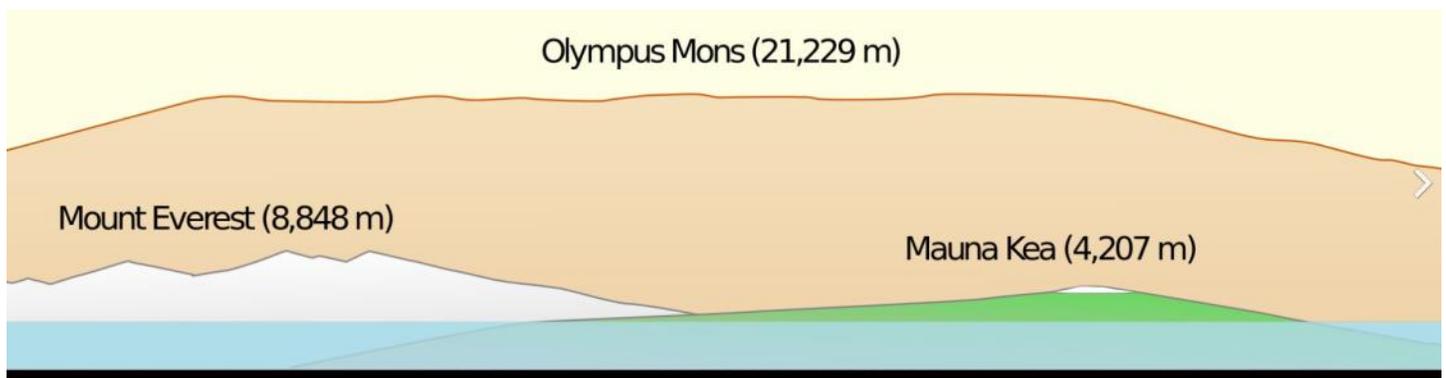
**Fig. 7** NASA composite demonstrating Valles Marineris  
 Source: [https://www.nasa.gov/multimedia/imagegallery/image\\_feature\\_83.html](https://www.nasa.gov/multimedia/imagegallery/image_feature_83.html)

kilometers (48 miles) across, and 1.8 kilometers (2.9 miles) deep. Fig. 7 is a composite of over 100 photos taken by Viking Orbiters in the 1970s. Valles Marineris spans more than one-half the diameter across!

#### Maps and Video Resources of Interest

There are many more features of interest on Mars. Please access the links below to explore and discover other mapping techniques and visualizations about this fascinating planet.

- The Mars Mineral Atlas is a video compiled by the European Space Agency. On a revolving sphere, it demonstrates the variation of minerals on the surface of the planet. <https://www.youtube.com/watch?v=64Ka6Q-Ki1Q>.
- Ian Webster shows Mars' topographic features on a rotating sphere.



**Fig. 6** Olympus Mons compared to Mount Everest and Mauna Kea Source: [https://en.wikipedia.org/wiki/Olympus\\_Mons](https://en.wikipedia.org/wiki/Olympus_Mons)

[www.Ianww.com/mars/](http://www.Ianww.com/mars/)

▪ An interactive topographic map identifies major surface features by scanning the map.

[https://en.wikipedia.org/wiki/Olympus\\_Mons](https://en.wikipedia.org/wiki/Olympus_Mons)

▪ A generalized geographic map of Mars compares four classes of surface features with their age.

<https://pubs.usgs.gov/sim/3292/>.

▪ A color-coded geology infographic "Map of Mars: The Geology of the Red Planet" is available. It shows geologic units (highland, basin and transition units), as well as geologic structures (fractures, faults and folds.)

<https://www.visualcapitalist.com/map-of-mars-the-geology-of-the-red-planet/>

### Sources Used for this Article

▪ All about Mars

<https://mars.nasa.gov/allaboutmars/mystique/history/>

▪ Kyle Chayka, *A Short History of Martian Canals and Mars Fever*, Popular Mechanics, September 28, 2015.

<https://www.popularmechanics.com/space/moon-mars/a17529/a-short-history-of-martian-canals-and-mars-fever/>

▪ Alfred Russel Wallace, *Is Mars Habitable*, 1907. Reproduced at MacMillan© at <http://people.wku.edu/charles.smith/wallace/S730.htm>

▪ A series of photographs includes the Lowell – Antoniadi comparison.

<https://artsandculture.google.com/exhibit/4ALy3KSjVtBnJw>

· Measuring the distance to the Moon

[https://en.wikipedia.org/wiki/Lunar\\_distance\\_\(astronomy\)#History\\_of\\_measurement](https://en.wikipedia.org/wiki/Lunar_distance_(astronomy)#History_of_measurement)

· Mars exploration

<https://mars.nasa.gov/programmissions/overview/>

### Endnotes

1 Amanda Briney, *Types of Maps: Topographic, Political, Climate, and More* (ThoughtCo, July 10, 2019, [www.thoughtco.com/types-of-maps-1435689](http://www.thoughtco.com/types-of-maps-1435689))

2 <https://mars.nasa.gov/allaboutmars/mystique/history/early/>

3 [https://en.wikipedia.org/wiki/Apparent\\_retrograde\\_motion#/media/File:Retrograde\\_Motion.bjb.svg](https://en.wikipedia.org/wiki/Apparent_retrograde_motion#/media/File:Retrograde_Motion.bjb.svg)

4 Christianus Huygens, *New Conjectures concerning the planetary worlds, their inhabitants and productions*, (English translation), 1698.

5 Nature, October 11, 1906.

6 E. Walter Maunder, *Are the Planets Inhabited?*, pp. 96 – 110, Harper & Brothers.

7 Betsy Mason, *Calafia*, Volume 29, Issue 1, pp. 16-18.

BOOK REVIEW, continued from page 25

is the one that shows how celestial maps changed from the lavishly illustrated constellations of the Renaissance to the precise, illustration-free star atlases of today.

On the other hand, Kanas's close focus provides a wealth of detail that my preferred approach would simply have glossed over, and its broad definition of the subject has gathered up a number of interesting edge cases that might otherwise have been omitted. *Star Maps's* comprehensiveness, for all its loquacious tendencies, is on balance a virtue. Like a curiosity shop packed to the rafters, it almost certainly has what you're looking for tucked away somewhere in its pages.

### Endnotes

1 Elizabeth A. Kessler, "Star Charts," in *The History of Cartography, Volume Six: Cartography in the Twentieth Century*, ed. Mark Monmonier (University of Chicago Press, 2015), p. 1459.

2 Anna Friedman Herlihy, "Renaissance Star Charts," in *The History of Cartography, Volume Three, Part 1: Cartography in the European Renaissance*, ed. David Woodward (University of Chicago Press, 2007), pp. 99-100.

3 Stephen J. Hornsby, *Picturing America: The Golden Age of Pictorial Maps* (University of Chicago Press, 2016).

VISIT OUR WEBSITE!

CALIFORNIA MAP SOCIETY

WELCOME

EXPLORE HISTORIC CARTOGRAPHY

MODERN MAPPING

CALIFORNIAMAPSOCIETY.ORG

# FINDING YOUR WAY ON MARS

## DR. FRED CALEF, III

It's almost impossible to get lost nowadays. What was once a de riger exercise of trying to connect a street address with an unwieldy paper map with a thousand folds to a size and orientation capable of being read with a confused squint has become a simple exercise of asking our cell phone where's the best four-star rated dim sum restaurant that then plots the path on a detailed map with street names, a travel time, and delicious pictures of what you want to eat. Behind the magic that is a mapping app on your phone is a satellite constellation taking gigabyte-sized images with details down to the recent flower bed you just planted or new solar panels on your roof, all coregistered by thirty-one global positioning satellites (GPS) giving you your location (sometimes with the help of cell towers and wifi) down to the width of a driveway.

On Mars, we are not so privileged. The four Mars rovers (including the Curiosity rover in Figure 1) that have traversed across the rust-dusted planet have done so mostly relying on their human counterparts back on Earth.

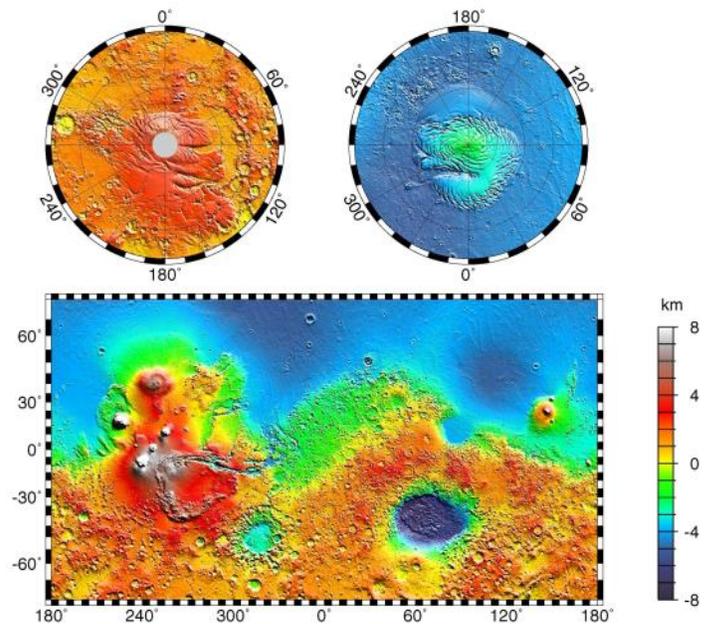


**Figure 1:** NASA's Curiosity rover-selfie on Oct. 11, 2019 at the "Glen Etive" drill site in Gale crater, Mars. This image is a mosaic of 57 individual images. Credits: NASA/JPL-Caltech/MSSS. Source: <https://www.nasa.gov/feature/jpl/new-selfie-shows-curiosity-the-mars-chemist>.

While there are six operational satellites in orbit around Mars, their primary duty is to collect scientific observations, not geolocate our intrepid wheeled spacecraft.

Like any explorer, we need to start with an accurate basemap. To make any map, you also need to start with a basic coordinate reference system linked to a planet's size and shape. Based on Mariner 9 spacecraft imagery and Mars' spin direction, a 'north pole' was declared and a datum setting the planet origin through the Airy-0 crater, named after Sir George Biddell Airy,

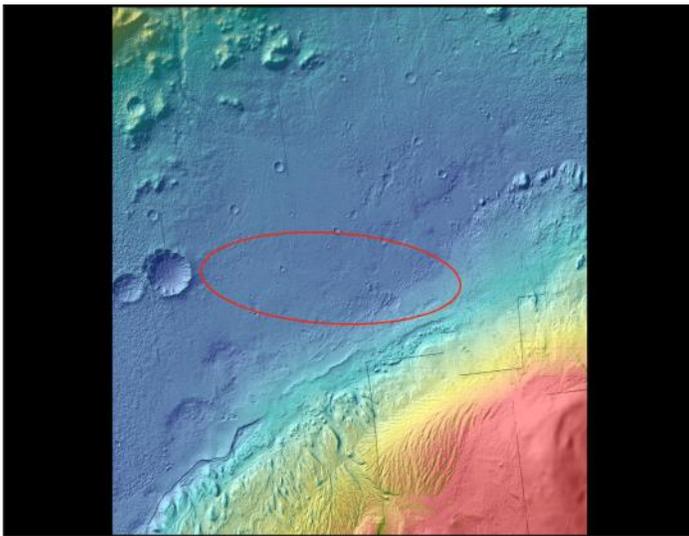
who installed the first transit used to set the prime meridian in Greenwich on Earth [1]. For mapping purposes, we use a similar longitude/latitude system with a range of  $\pm 90^\circ$  parallels towards the poles and  $0^\circ$ - $360^\circ$  or  $-180^\circ$ / $+180^\circ$  for meridians. Map projections are set for maps depending on your location, extent, and whatever physical parameter you want to denote, just like on Earth. Mars' modern shape comes from the Mars Orbiter Laser altimeter (MOLA) dataset created from a similarly named instrument onboard the now-defunct Mars Global Surveyor (MGS) back in the early 2000s [2] (Figure 2).



**Figure 2:** Mars Orbiter Laser Altimeter (MOLA) elevation map of Mars. This dataset was created from over 600 million laser altimeter shots of the Martian surface. Prominent surface features include the Tharsis volcanic rise at longitude 260 and latitude 0. Prominent craters, valleys, and water-carved channels can be elucidated. Mars' north and south polar ice caps are detailed in the polar projection at top. Credit: NASA/JPL/GSFC

It established the shape of Mars down to half-kilometer sized blocks with a  $\sim 300$  m horizontal and  $\sim 1$  m vertical accuracy across the whole planet [3]. Today, the work-horse satellite is the Mars Reconnaissance Orbiter (MRO) providing two critical imaging instruments, the Context (CTX) [4] and High Resolution Imaging Science Experiment (HiRISE) [5] cameras. Respectively, the CTX has a pixel size of  $\sim 6$  meters (a small house) covering almost all of Mars [6] and HiRISE  $\sim 30$  cm (a laptop) in selected spots ( $< 5\%$  of the planet). In most areas, this is more than sufficient to map out geologic differences across the Martian terrain. However, when you want to land a billion-dollar spacecraft on the planet, we need a lot more information. For starters, we use stereo pairs to create high-resolution elevation models (1 m/pixel) [7] and orthophotos (images corrected

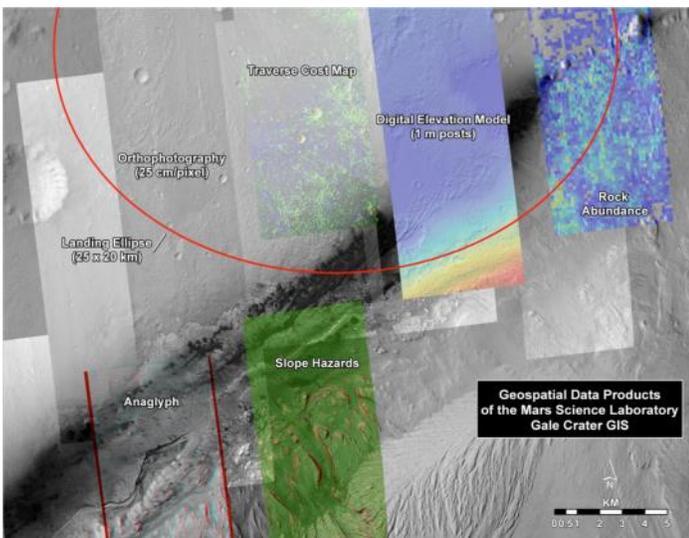
for elevation differences) [8] of the whole landing site, which for the Mars Science Laboratory (Figure 3) and future Mars2020 rover landing about a year from now, is less than 20 km<sup>2</sup>.



**Figure 3:** HiRISE Orthophoto (left) and elevation model (right) mosaics for the Curiosity rover science team. Both datasets are used for geologic mapping and rover localization. Credit: NASA/JPL-Caltech/MSSS/University of Arizona/USGS.

Source: [https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL\\_Gale\\_DEM\\_Mosaic\\_10m](https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL_Gale_DEM_Mosaic_10m)  
<https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/>

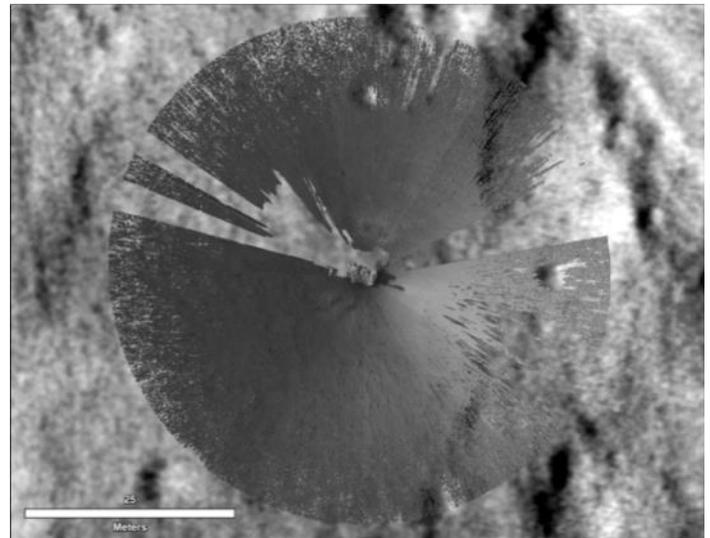
The elevation data provides us information about slope and the HiRISE images provide rock sizes and distributions, which we extract with a version of machine learning [9].



**Figure 4:** Landing site geospatial data layers for site analysis, route planning, and geologic mapping. Credit: NASA/JPL-Caltech/MSSS/University of Arizona/USGS.

We use all that information to find safe and scientifically interesting landing sites as well as allowing rover drivers, who control where and what the robot will do, to figure out how far and where it's safe to drive (Figure 4). Scientists, of course, take advantage of these enormously detailed basemaps to figure out which outcrops they want to visit to learn about the geologic history there.

Without GPS, we revert to some basic mapping standards to find out where the rover is. While the rovers do carry an inertial measurement unit (IMU) that can measure the displacement from a drive and knowing where the sun is from images fixes north, after tens of meters driving, the rover will begin to lose a sense of where it is, much like walking blindfolded. To adjust for that position drift, we georeference, or "localize", the rover based on features we see from orbit and on the ground [10]. Wherever we land or drive, the rover will take a stereo image mosaic from the ground. This is converted into an elevation model to build an orthophoto at 1 cm/pixel over an area of ~45 m radius from the rover's position. We then slide the orthophoto over the basemap to recognize similar features, a rock, crater, or ridge, and align them, localizing the rover to all of Mars (Figure 5).



**Figure 5:** Localizing the Curiosity rover with navigational camera (NAVCAM) images at Bradbury Landing. Notice areas where data is "missing" around craters. Rocks, craters, and other albedo markings help correlate the rover images to the orbital basemap. Credit: NASA/JPL-Caltech/University of Arizona/USGS.

With all the technology available to us, we have done this manually (and successfully, I might add) for every Mars rover so far! Mostly this is because we often don't get full panoramas and the jump in resolution between the ground image (and its limited extent), and the orbital basemap is large enough to make this a non-trivial machine matching exercise. That said, we're looking to try automating localization with the next rover.

er, but there will always be a "human in the loop" to verify its accuracy. While this may seem trivial, it provides the basis for scientists to look at rocks kilometers apart and offset hundreds of meters and refine their hypotheses based on chemistry, mineralogy, and stratigraphy. While the first question an instrument scientist might ask is "what's this rock made of," the second question almost always is, "where is this rock compared to others?" Without localization, the science observations would be mired in the abstract instrument coordinate systems, which have no connection to the real world!

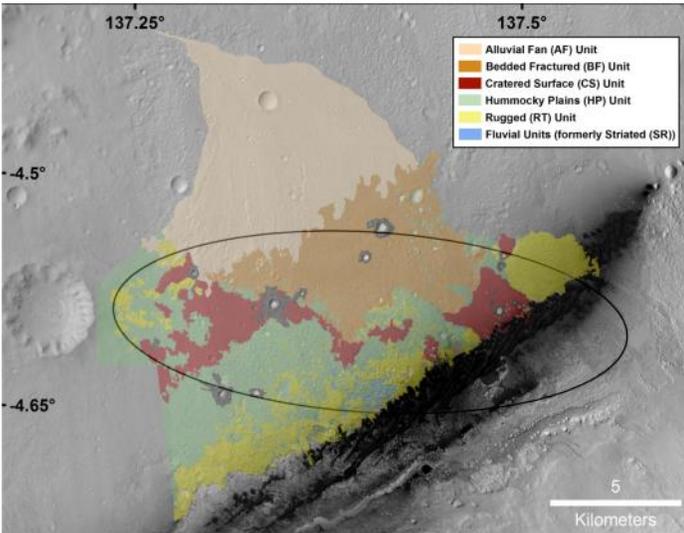


Figure 6: Geologic basemap of Aeolis Planum in Gale Crater, Mars. Source: <https://www.lpi.usra.edu/meetings/lpsc2013/pdf/2511.pdf>

Once we know where we are, we can begin mapping! Like most mappers, we start with orbiter based, photogeologic maps to get an idea of what the geology is like, for example, the geologic basemap of Aeolis Planum [11] (Figure 6) where the Curiosity rover landed in Gale crater.

As the rover drives, we get a "strip map" view of the surface, which we can use to refine and improve the geologic maps with high-resolution imagery and in situ science results from cameras, spectrometers, and even wet chemistry experiments. Dr. Larry Crumpler assembled the some of the first "field geology" maps while working on the Mars Exploration Rovers (MER) Spirit and Opportunity [12] (Figure 7).

These in situ views and geologic observations are key to understanding what's happening at the surface and spreading the interpretation to distant bedrock exposures. We've only landed successfully on eight places on Mars, and every ground observation counts!

When we drive the rover, we explore a new part of Mars, expanding our geologic map [13] (Figure 8, next page). Some-

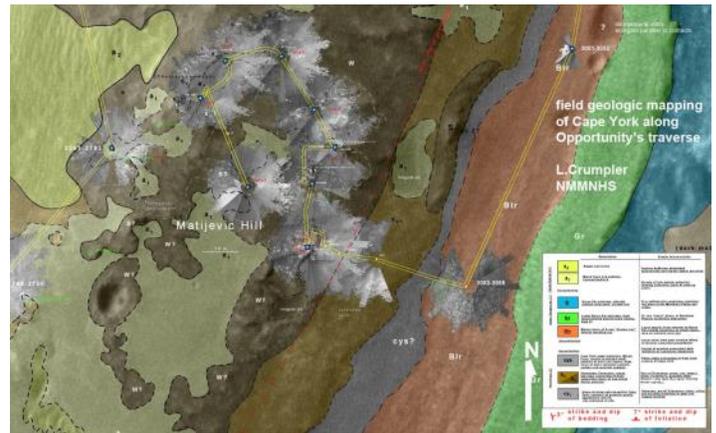


Figure 7: Field geologic map of Cape York on the Endeavor crater rim. Credit: Dr. Larry Crumpler. Source: <https://www.planetary.org/blogs/guest-blogs/crumpler-sol3111.html>

day, I hope the maps we make with the Mars rovers will be held by the first human on the planet to help guide their way.

### References:

- [1] Gerard de Vaucouleurs, Merton E. Davies, Francis M. Sturms Jr. , "Mariner 9 Areographic Coordinate System", *Journal of Geophysical Research*, Volume 78, Issue 20, Pages 4395-4404, 1973. <https://doi.org/10.1029/JB078i020p04395>
- [2] [https://astrogeology.usgs.gov/search/details/Mars/GlobalSurveyor/MOLA/Mars\\_MGS\\_MOLA\\_DEM\\_mosaic\\_global\\_463m/cub](https://astrogeology.usgs.gov/search/details/Mars/GlobalSurveyor/MOLA/Mars_MGS_MOLA_DEM_mosaic_global_463m/cub)
- [3] Smith, D. E., et al., "Mars Orbiter Laser Altimeter— Experiment summary after the first year of global mapping of Mars", *Journal of Geophysical Research*, 106(E10), 23689–23722, 2001. <https://doi.org/10.1029/2000JE001364>
- [4] [http://www.msss.com/all\\_projects/mro-ctx.php](http://www.msss.com/all_projects/mro-ctx.php)
- [5] <https://hirise.lpl.arizona.edu/>
- [6] [http://murray-lab.caltech.edu/#flip8\\_anchor](http://murray-lab.caltech.edu/#flip8_anchor)
- [7] [https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL\\_Gale\\_Orthophoto\\_Mosaic\\_10m\\_v3](https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL_Gale_Orthophoto_Mosaic_10m_v3)
- [8] [https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL\\_Gale\\_DEM\\_Mosaic\\_10m](https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL_Gale_DEM_Mosaic_10m)[https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL\\_Gale\\_Orthophoto\\_Mosaic\\_10m\\_v3](https://astrogeology.usgs.gov/search/map/Mars/MarsScienceLaboratory/Mosaics/MSL_Gale_Orthophoto_Mosaic_10m_v3)
- [9] M. Golombek, A. Huertas, D. Kipp, F. Calef, "Detection and Characterization of Rocks and Rock Size-Frequency Distributions at the Final Four Mars Science Laboratory Landing Sites", *The International Journal of Mars Science and Exploration Open Access Journals*, Mars 7, 1-22, 2012; doi:10.1555/mars.2012.0001

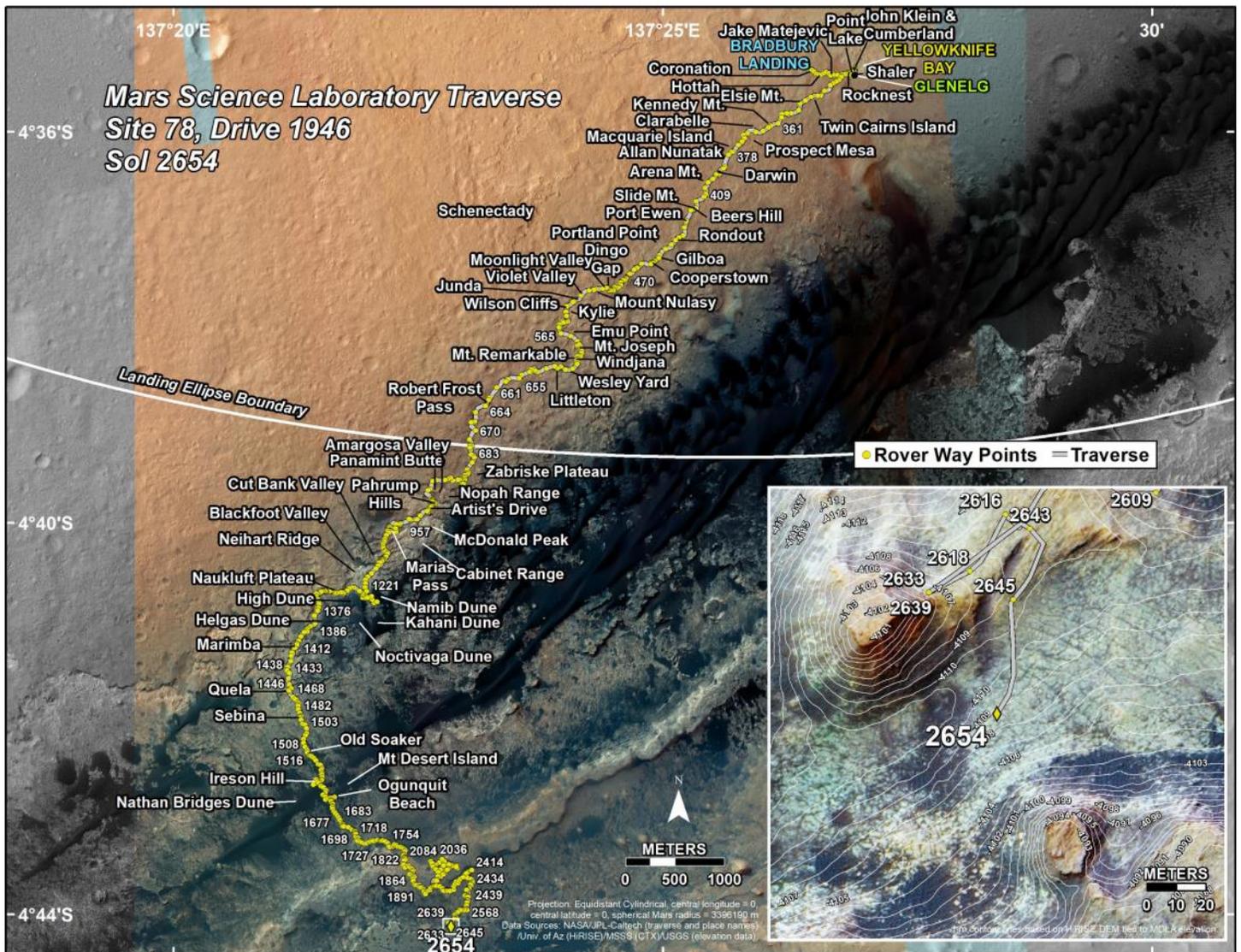


Figure 8: NASA's Curiosity rover traverse map up through 2654 Martian day (January 24, 2020). Credit: NASA/JPL-Caltech/Univ. of Arizona. Source: <https://mars.nasa.gov/resources/24751/curiositys-traverse-map-through-sol-2654/?site=msl>

[10] Parker et al., "Localization and 'Contextualization' of Curiosity in Gale Crater, and other Landed Mars Missions, 44th Lunar and Planetary Science Conference (2013), abstract #2534.

[11] Grotzinger et al., "A Habitable Fluvio-Lacustrine Environment at Yellowknife Bay, Gale Crater, Mars," *Science*, Vol. 343, Issue 6169, 2014. DOI: 10.1126/science.

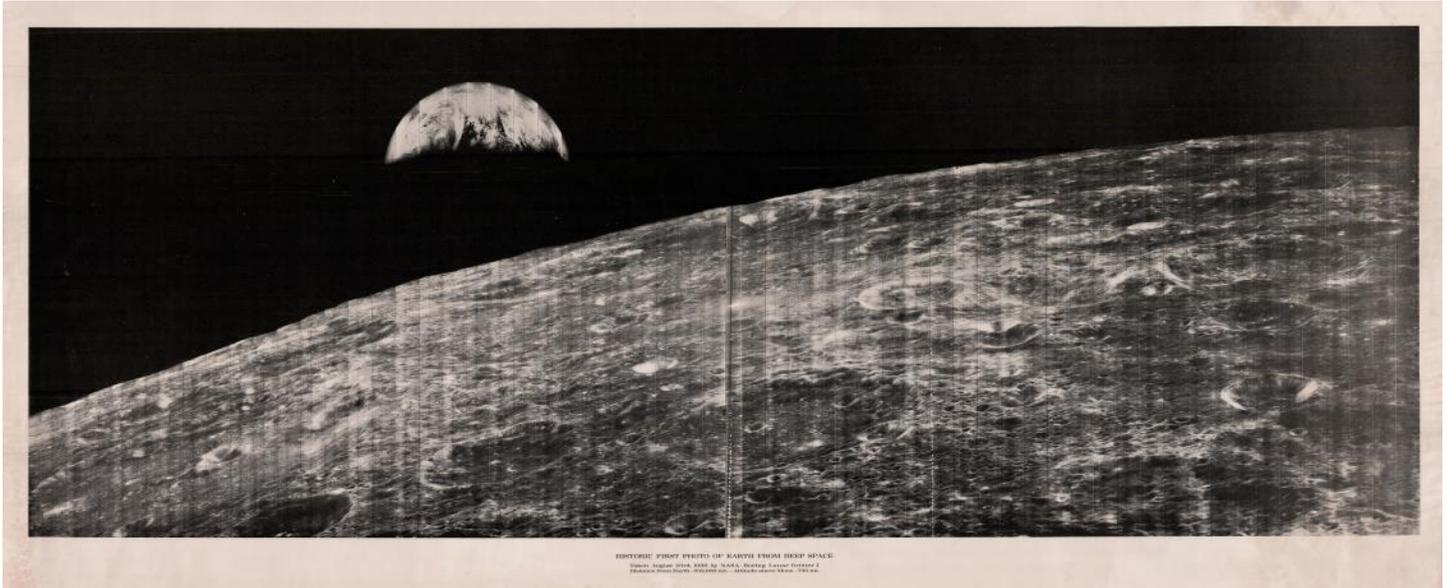
[12] Crumpler et al., "Context of ancient aqueous environments on Mars from in situ geologic mapping at Endeavour Crater", *JGR Planets*, Volume 120, Issue 3, Pages 538-569, 2015. <https://doi.org/10.1002/2014JE004699>.

[13] [https://mars.nasa.gov/msl/mission/where-is-the-rover/?page=0&per\\_page=25&order=sol+desc&search=&category=176%3A295&curl\\_suffix=%3Fsite%3Dmsl](https://mars.nasa.gov/msl/mission/where-is-the-rover/?page=0&per_page=25&order=sol+desc&search=&category=176%3A295&curl_suffix=%3Fsite%3Dmsl)



# THE ROGUE PHOTO TAKEN ON THE WAY TO MAPPING THE MOON

CURTIS BIRD



*First Photo of Earth from Deep Space—NASA*

When President Kennedy gave a speech saying that "We choose to go to the moon..."<sup>1</sup>, it wasn't just an idea which he had first proposed to Congress in 1961 and reiterated to a large crowd at Rice University in Houston in 1962. It was a galvanizing force he had tapped into. And it connected deeply with the vision and the reservoir of energy found in young people at the time, who were ready to leave behind the pain and hardship of the WWII era. And if the post-war era was a time of renewed optimism and direction, this statement of Kennedy's provided a bright target toward which to aim.

It's said that the cadre of young engineers and scientists that were getting hired through NASA's nascent space programs in the late 1950s and early '60s had a certain confidence and swagger. There was a matter of fact, can-do attitude to those new hires, such as those at JPL-NASA, where they had not-so-jokingly summed their perspective of the technical challenges before them with, "just give us the money, we'll give you a product"<sup>2</sup>. Indeed, in their looking toward the future, there was a desire not just to begin to explore the moon, but, under the infectious spirits of the space program's early leaders, Dr. Wernher Von Braun and William Pickering, their target was to actually send ships to all the planets in our solar system.

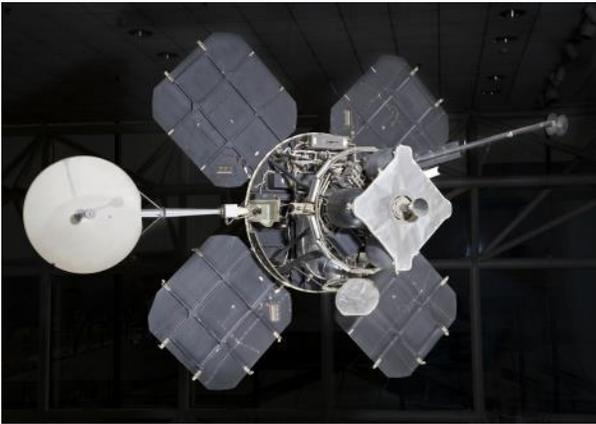
It was a new world, just opening, with unprecedented breakthroughs in nuclear science, electronics, aviation, computers, and more. There were fields which hadn't existed for their parents or grandparents, and yet, for these young people, were

quickly falling into place, and forecasting a future of amazing potential.

But this enthusiasm would be tempered by a more and more painful succession of failures and second-place finishes as compared to the advancing Soviet accomplishments in space. The first satellite (1957), the first man in space (1961), and the first object to reach the moon (1959) would all be spotlighted Soviet firsts, with the U.S. attaining the same achievements some time later (1958, 1962, 1964 respectively).

American attempts at what were assumed to be simple goals were faltering at every step. For example, the Ranger program, whose aim was to send a vehicle to the moon, and have it crash into the surface lunar surface while sending back better and clearer images of the moon's landscape, had been a grinding series of failures. The first two missions in 1961, Ranger 1 and Ranger 2, had both failed to achieve orbit and had burned up in the Earth's atmosphere. Ranger 3, in 1962, had an internal computer failure and was dead in solar orbit, unable to continue its mission. The same year Ranger 4's master clock had failed, and the vehicle had crashed lifelessly into the moon, with none of its camera systems broadcasting. Its successor, Ranger 5, missed the target of the moon entirely, and had to be disabled. After the Ranger 6 launch, the cameras inexplicably came live while in route and then died, so that the vehicle impacted the moon without sending any images or significant scientific data back to Earth.

The team's morale was at its lowest after this last failure, but it was about to get worse as Congress prepared to intervene with an inquiry into the value of the program altogether. The price tag for the Ranger missions' failed attempts tallied up to \$1,200,000 (est. \$9,800,00 today), and Congress wanted answers. Blame was targeted at individuals (some of whom were removed), as well as at numerous technical issues. For the staff at NASA, however, the accelerated timeline and poor interdepartmental communications, which hadn't harmonized the highly complex mechanical and electrical fundamentals, were the true culprits.



*Lunar Orbiter Spacecraft—NASA*

After some reorganization of the program, it was allowed to continue, and shortly afterward finally produced a great success! In July of 1964, Ranger 7 televised crisp images of the Mare Cognitum right up to the moment of impact, unveiling terrain, and giving viewers the first close-up images of the lunar surface. Cheers and champagne for all the staff were well deserved, and two more successful Ranger missions following soon after.

There were continued victories for NASA with the Lunar Surveyor program, which included the first soft landing of a vehicle on the moon's surface, enabling it to pan around the area, and send photographs of the landscape back to the scientists. But the probes that landed were stationary, and therefore could supply views of only a small scope of the planet. While it was exciting to see images of the dust fields, craters, and rocks, the photos weren't great technical references.

With the vision, still, of "landing a man on the moon and his safe return"<sup>3</sup>, we were no closer to understanding where we could land our astronauts amidst all those the craters and boulders despite the Ranger and Surveyor missions. We needed a comprehensive overview of the moon's surface, quickly, and we weren't that much closer to the objective after years of these mostly disastrous attempts!

The Lunar Orbiter program had a single mission: to map the lunar surface prior to the planned Apollo manned missions. While later missions had certainly provided improved and closer photos for portions of the moon, we still needed a methodical and consistent approach to mapping the entire surface. NASA funded the program, but with the failures of the Ranger program in mind, they calculated that the odds of success were low. Therefore, they determined that this program, through Boeing, would require at least five separate missions, and they had built in extras in anticipation of a series of expensive attempts before any significant success was achieved.

The bright young engineers at Boeing, based in the Seattle area, began to work on the program and came up with an ingenious method to systematically photographing the moon's surface by sending back the images through television signals. At the heart of their space vehicle was a 150-pound camera system developed by Eastman Kodak, which had a pre-established track record, as it had been used in the earliest spy satellites, and was well proven. With dual lenses, the latest in transistor technology, and solar panels for electrical power, this wonder was a self-contained photo lab and television studio able to broadcast back to Earth.

Flying as low as 28 miles above the moon's surface, the cameras would be able to capture two simultaneous images of the same region, one wide lens view in medium resolution giving an overview, the other narrowed lens finely focused with resolution to a few meters, supplying the interior portion. Once the shutter snapped the image, the almost magical process would begin. Each photo would be developed in a semi-dry approach, with no liquid developer or fixer, and would be slowly moved over to an electron gun which would meticulously scan each image, translating the images into television signals, which in turn would be sent down to Earth with receivers in the U.S., Australia and Spain.

One engineer on the Lunar Orbiter project, Art Cosgrove, summed up the concentration and focus of the team by saying that everyone had the implicit clarity that they knew they needed to "avoid vanities and create this complex vehicle"<sup>4</sup>. It was a once-in-a-lifetime task. And while working to the highest standards, conscious of an only 1 in 5 chance of succeeding, there were still some members of the team who could think outside the box, looking at the bigger picture—maybe even bigger than the mission plan.

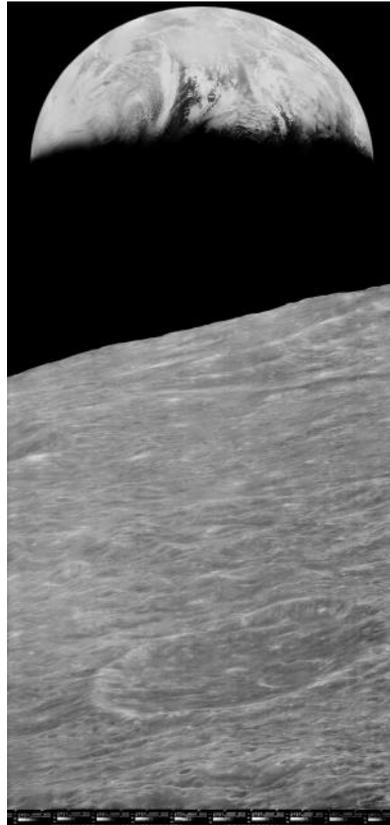
One of these team members, a young engineer named Dale Shellhorn, was raised under the big desert skies of Arizona. Graduating with a degree in Physics, starting his career with Boeing, and working on the mission, a thought grabbed him.

"What if we pointed the camera back at Earth before it enters lunar orbit?" he wondered. This novel and a technically challenging idea would demand turning the vehicle while in flight, and bringing the cameras live to take the shot back at Earth, all prior to reaching lunar orbit and specific focus of the mission. His idea was incredibly risky, especially on this first Lunar Orbiter mission.

But Shellhorn mentioned his idea to one of the night managers on the project, Ted Hanson, who became enthused and agreed to help out. Together, they decided to proceed without any consultation or mention of their plan to Robert Helberg, the head of the Boeing Lunar Orbiter team. While any non-scheduled photos would completely outside of the planned mission, Dale, and his accomplice, Ted, felt pretty confident of their ability to succeed.

And - they did it! The date was August 23rd of 1966. After waiting hours for the image to develop, downlink, and send, they saw that their plan had actually worked! It must have been absolutely stunning to be the first humans to behold that first glimpse of Earth from space! But, when NASA discovered what Shellhorn had done, they wanted him "fired." In the wake of all their previous failures, Congressional investigations, and Soviet firsts, anyone who took over the vehicle, left the mission playbook, and used NASA property for a quick photo had to be removed from the program.

In the end, Shellhorn wasn't removed, nor was his accomplice. The photo became public, was transmitted around the world by the news services, and was hailed as an American victory. Though grainy and striated from the broadcasting method used, prints were disseminated throughout the government as a tangible reward and an accomplishment of the Lunar Orbiter program. Robert Helberg, the (unconsulted!) head of the program, even eventually had the image added to his business card. The first photograph of the Earth from space was a powerful tool for the U.S., not just in its accomplishment, but in providing a perspective that had a psychological impact... it was as if the U.S. was already on the moon, looking back at Earth. A few years later and that sentiment would become a reality as the U.S. astronauts would land Apollo 11, with the help of Dale Shellhorn, who worked on coordinating their location once they landed. In their grate-



*First View of Earth from Moon, reprocessed—NASA*

fulness and appreciation of his work, he'd receive a signed flag from the astronauts once they returned.

The Lunar Orbiter program seemed to signal a shift in American luck in the space race. Not only did the first mission accomplish more than its intended flight program and mapping, but so did its next two sister missions. As a matter of fact, in the first three missions, there were no catastrophic failures, but only the unexpected rewards of completion and growth. By the fourth and fifth missions, most of the lunar surface had been mapped, coverage was redundant, and they even took a few more images of the moon with Earth nearby.

But the Lunar Orbiter program didn't just end once they were crashed into the lunar surface. The original data has been retrieved from JPL-NASA archives, by LOIRP, which is reprocessing the data with new technology and unveiling even deeper detail from those original images. For scientists studying crater formation and meteor strikes on the moon,

these old Lunar Orbiter photos are being unveiled with higher detail and compared with modern missions. So the efforts of some young engineers, decades ago, continue to convey valuable information still today, thanks to the dedication and confident risk-taking of pioneers such as Dale Shellhorn.

#### Endnotes

- 1 <https://www.youtube.com/watch?v=TuW4oGKzVKc> President Kennedy "Moon Speech" 1962
- 2 KOPPEL, CLAYTON R., *JPL and the American Space Program: A History of the Jet Propulsion Laboratory*. Yale University Press, 1982. <https://www.jstor.org/stable/j.ctt1ww3tz9>
- 3 <https://www.youtube.com/watch?v=TUXuV7XbZvU> President Kennedy "Landing a Man on the Moon" 1961
- 4 [https://www.youtube.com/watch?v=mSElt8su\\_34](https://www.youtube.com/watch?v=mSElt8su_34) Art Cosgrove: Kodak and The Lunar Orbiter Mission. <https://uanews.arizona.edu/blog/apollo-11-reaching-moon>

Curtis Bird is a map dealer based in Denver, Colorado, where he and his amazing wife Alanna raise their two boys, in the foothills of the Rockies. For almost thirty years, their gallery in downtown Denver has offered maps, charts, and prints with a unique breadth and depth. A most recent project has been a podcast focused on history, exploration, and cartography, which is available through iTunes and Google podcasts; just search for "New Projections."

# CELESTIAL MAPS—A PRIMER

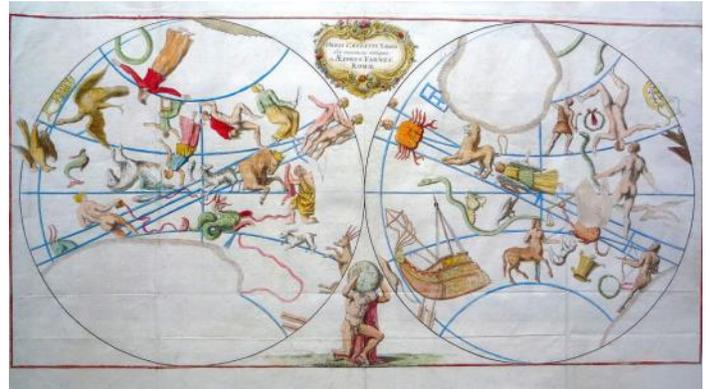
NICK KANAS, M.D.

Observing the sky and accurately locating objects in the heavens has had many important ramifications throughout history. Astronomers to the king could watch for and anticipate sudden changes in the brightness of a star or the appearance of a coma, which often represented a bad omen for the stability of the government. Navigators used stellar positions to locate their position on the high seas. Farmers used the appearance of stars and asterisms to anticipate favorable planting, such as the first appearance of the star Sirius as an indicator that the Nile would soon be flooding the land with nutrient rich soil. Philosophers constructed cosmological diagrams of the universe according to different models (e.g., Earth-centered vs Sun-centered). Finally, historians reordered cultural history and ethics through myths represented by stellar constellations in the heavens.

In Western culture, stars were mapped in patterns called constellations. This tradition actually went back to the third Millennium B.C., where the Sumerians, recorded names on clay tables like the bull, lion, and scorpio that suggested they envisioned constellations similar to those we see even today. The ancient Greeks borrowed some of these and added constellations of their own. This system was summarized by the Greek geographer and astronomer Ptolemy, who around 150 A.D. wrote his famous *Almagest*. This influential book described Greek mathematical astronomy and theory and included a catalog of 1,022 stars in 48 classical Greek constellations that were named for mythological figures. Star magnitudes were listed and categorized, and stellar positions were given according to their celestial latitude and longitude, oriented to the ecliptic (the path of the Sun in the sky), as well as to their location in figures representing each constellation.

The oldest existing map of the classical Greek constellations actually appears on a marble globe that once belonged to Cardinal Alessandro Farnese and is now in the National Museum in Naples. It consists of a statue of Atlas holding a 65-cm-diameter celestial globe on his back, on which are carved a number of heavenly circles (equator, tropics, poles), the ecliptic, and 43 of the 48 Greek constellations. Although dating back to the 2<sup>nd</sup> Century A.D., the location of the stars with reference to the crossing of the equatorial and ecliptic lines at the equinoxes tells us that it was copied from a Greek model of around the 2<sup>nd</sup> Century B.C, the time of the famous Greek astronomer Hipparchus. A rubbing of this globe and a small image of the statue are shown in Figure 1. Note that the constellations are shown left to right reversed from the way they appear looking up from the Earth, since they are carved on a marble sphere.

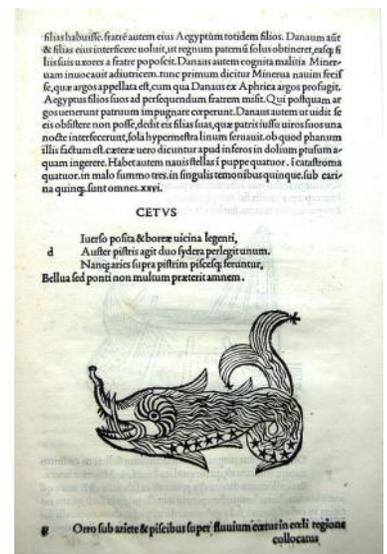
In the Middle Ages, Greek mathematical astronomy largely disappeared, and with it went accurate depictions of stellar locations on grids of celestial latitude and longitude. Although woodcuts of constellations appeared as illustrations in manuscripts, stellar locations were not depicted with any degree of accuracy vis a vis each other or their location in the sky (see Figure 2).



**Figure 1.** This paper transcription from the Farnese Atlas was drawn in stereographic projection by Martin Folkes. It appeared in the 1739 edition of Manilius' *Astronomicum ex Recensione et cum Notis Richardi Bentleyi*, edited by the English classicist Richard Bentley. 25.9 X 52.1 cm. Note many of the classical Greek constellations, the zodiacal constellations along the triple lines indicating the region around the center ecliptic line, the gaps representing areas of damage or places where Atlas is holding the globe, and a picture of the statue in the lower center.

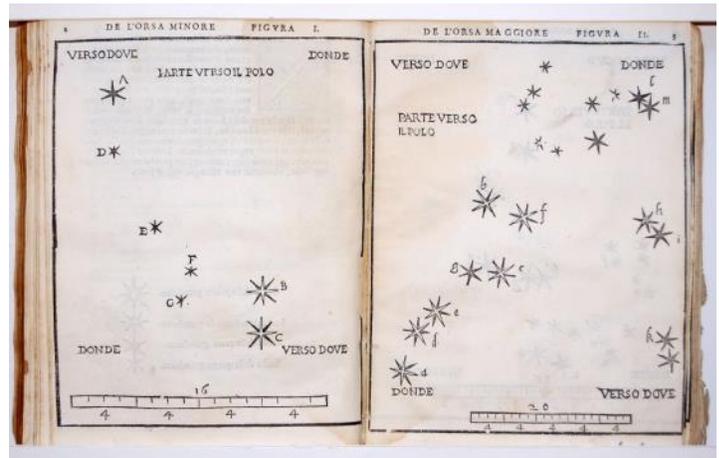
This situation changed during the Renaissance, where Greek mathematical astronomy came back to Europe and where improvements in printing and mapping allowed stars to be more accurately mapped in the heavens. In 1515, Albrecht Durer

**Figure 2.** The constellation of Cetus, from Firmicus Maternus' *Scriptores Astronomici Veteres*, Aldine Press, 1499. 27.4 X 17.8 cm (page size). Note the simple but dynamic figure and the lack of relationship of the stars to their actual position in the sky. This was because the image was meant to be an illustration for the text describing Cetus and was not a true star map.



printed two woodcuts showing the Greek constellations in the northern and southern celestial hemispheres. Each employed a polar stereographic projection, with the ecliptic celestial pole in the center and the zodiac constellations around the periphery. The stars patterns were shown left to right reversed like on the Farnese Atlas. However, they were positioned in a primitive coordinate system of celestial latitude and longitude based upon Ptolemy's star catalog, although constellation figures also were depicted. See Figure 3 for Durer's northern celestial hemisphere.

Further progress in star mapping occurred in 1540, when the Italian polymath Alessandro Piccolomini published the first star atlas, *De Le Stelle Fisse*. As shown in Figure 4, the star



**Figure 4.** The constellations of Ursa Minor (left) and Ursa Major (right), from the 1579 edition of Piccolomini's *De le Stelle Fisse*. 17.5 X 13.9 cm (left image), 17.7 X 14.1 cm (right image). Note the geocentric orientation, the Roman letters and different sizes and shapes of the symbols representing the stars' magnitudes, and the generally accurate star pattern for the constellation, despite the absence of an artistic image.

The 17th Century ushered in the Golden Age of celestial cartography in Europe. Four individuals particularly advanced the field and influenced the work of other celestial cartogra-



**Figure 3.** The northern celestial hemisphere produced by Albrecht Durer in 1515. Approximately 42.9 X 42.9 cm. Note the radial lines resulting in a primitive coordinate system, allowing the stars to be located in the heavens. This woodcut is the first printed star map. It is centered on the ecliptic pole and uses an external orientation. Courtesy of the Collection of Robert Gordon.

patterns were shown as viewed from the Earth in each woodcut plate, which corresponded to a Ptolemaic constellation, although there were no constellation images. Star magnitudes were indicated by the size and shape of the stellar symbols and by their Roman letter labels (with "a" being brightest, "b" next, etc.). A degree scale at the bottom gave a sense of the constellation's size. Constellation and star locations were indicated through statements on each plate identifying the direction to the celestial pole.



**Figure 5.** A later-colored image featuring the constellation Bootes, from a mid-1600 edition of Bayer's *Uranometria*. 27.5 X 37.8 cm. Note the use of Greek letters to indicate stellar magnitude (with alpha being the brightest), the use of an accurate grid system aligned with sub-degree indicators in the margins, and non-featured constellation star patterns surrounding Bootes (e.g., the handle of the Big Dipper in the upper right).

phers. The first of these was Johann Bayer, a Bavarian lawyer and amateur astronomer, who in 1603 published his great star atlas *Uranometria*. His chart of the 48 classical Greek constellations were engraved in copper, allowing for finer precision of the lines depicting the constellation figures (see Figure 5, prior page).

Each plate employed a trapezoidal projection and included a celestial latitude and longitude coordinate grid oriented to the ecliptic. The margins were calibrated to allow star positions to be determined to a fraction of a degree. Over 2,000 stars were plotted and labeled in order of magnitude using Greek letters, with “alpha” being the brightest in the constellation. In addition, 12 new constellations were depicted that were created from stars catalogued by explorers sailing into the southern hemisphere.

The next great star atlas was by Johannes Hevelius, the son of a wealthy brewer in Poland who used the profits from the family business to support his interest in astronomy. His famous celestial atlas, *Firmamentum Sobiescianum sive Uranographia*, was published in 1687. The stars were precisely plotted in a trapezoidal projection using ecliptic coordinates. Their locations were based on his accurate star catalog of over 1,500 stars. Unlike Bayer, the more traditional Hevelius went back to the Durer and celestial globe tradition in depicting the star patterns and constellations left to right reversed from the way they appear to us looking up from Earth (see Figure 6).

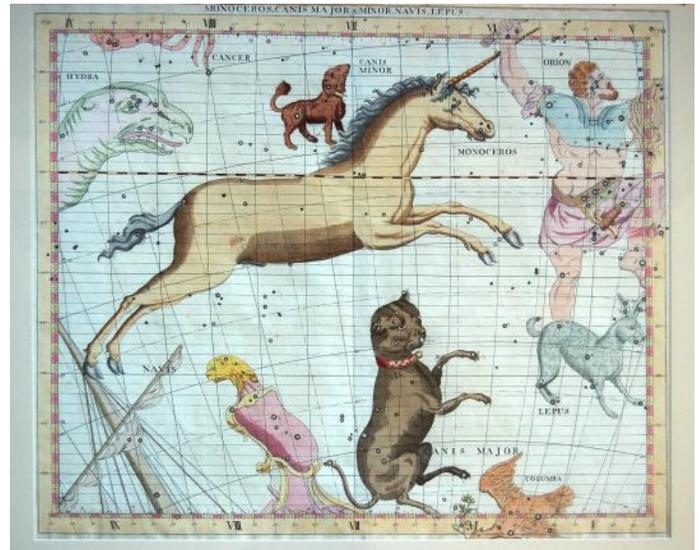
In 1729, the posthumous publication of *Atlas Coelestis* occurred. Developed from the work of John Flamsteed, England’s first Astronomer Royal, it showed the positions of 3,000 stars plotted from his meticulous star catalog in constel-



**Figure 6.** “Fig. F” constellations from Hevelius’ *Firmamentum Sobiescianum, sive Uranographia*, first published in 1687. 29.2 X 36.3 cm. Note the external orientation, Bootes (shown from the back) standing on the now obsolete Mons Maenalus and holding his two hunting dogs (now called Canes Venatici), Corona to his right, Coma Berenices to the lower left, and the handle of the Big Dipper in Ursa Major to the upper left.

lation images as seen from the Earth (See Figure 7). Using a sinusoidal projection, it was the first major work to use a coordinate system oriented to the celestial equator (which was a

projection of the Earth’s equator in the sky), rather than to the ecliptic. This made his atlas more useful for the newer equatorially-mounted telescopes, which could track the

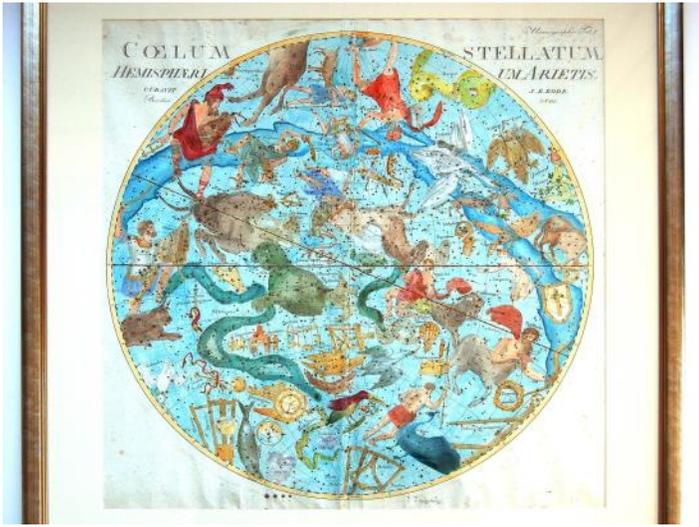


**Figure 7.** The map labeled “Monoceros, Canis Major & Minor, Navis, Lepus”, from Flamsteed’s *Atlas Coelestis*, published in 1729. 47.3 X 58.2 cm. Note the great detail and the double-grid coordinate system, with the new one oriented to the celestial equator (shown here as the prominent horizontal line going through Monoceros and Orion), and the older system off-set 23½ degrees and oriented to the ecliptic.

movement of the stars in the sky throughout the night without the need to continually move the telescopes. Flamsteed’s atlas was a milestone in celestial cartography that influenced later atlases for the next 100 years.

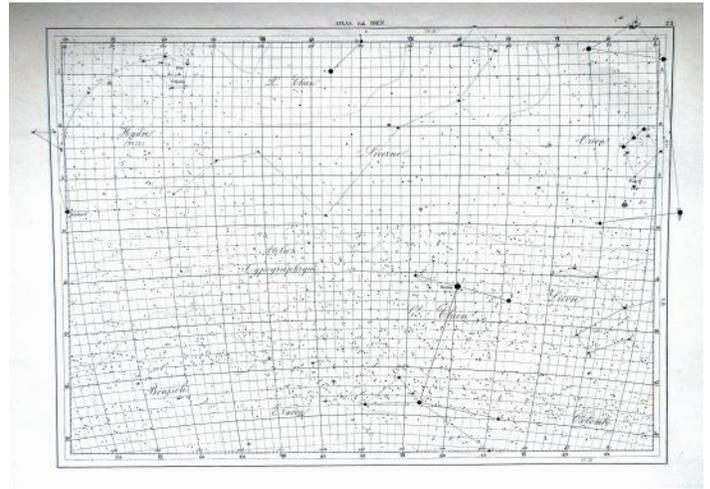
In 1801, the Director of the Berlin Observatory, Johann Bode, published his magnum opus: *Uranographia*. This was the largest pictorial star atlas produced up until that time and included over 17,000 stars, over 100 constellations and asterisms, and a conic projection that was thought to minimize distortions in stellar patterns (see Figure 8, next page). But many of the constellations the atlas were invented by Bode to honor patrons or popular figures, and this contributed to cluttered appearance and made it difficult to determine if a line or dot as part of the figure or part of an image in the sky as seen through a telescope.

In the 19th Century, the development of photography and micrometers (and later, computers) that could be used with ever more powerful telescopes made it necessary to create maps that depicted every fainter star in smaller areas of the sky. Consequently, the need for constellation images was lessened, since their lines and dots simply added to the clutter. In 1922 the International Astronomical Union decided to promote universal standards in celestial mapping by agreeing to 88 official constellations and drawing up boundaries based on

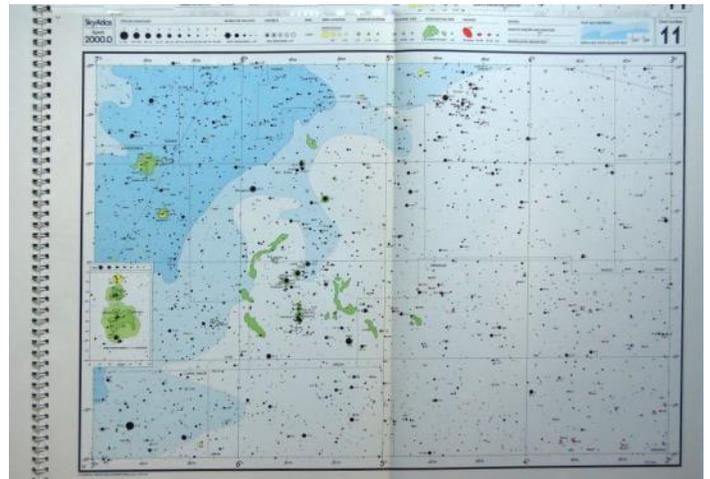


**Figure 8.** An unusual hemispheric view that is not centered on a celestial pole but instead is centered on the position in the sky of the vernal equinox, from Bode's 1801 *Uranographia*. 56.6 cm dia. hemisphere. Note the plethora of stars and constellations, more than in any previous atlas. Note also the crossing of the horizontal celestial equator line and (23½ degrees apart) the ecliptic line at the so-called "first point of Aries", designated as the point of 0 degrees celestial longitude.

agreed-upon areas of the sky rather than on constellation figures. As a result of these changes, celestial maps began to lose their images, first by subduing the figures, then by deleting them in favor of lines connecting the principal stars, and then by omitting these line patterns altogether (see Figures 9 and 10 to the right). Modern star atlases hardly resemble the atlases of yore, although they show many more stars along with deep sky objects such as galaxies and nebulae, and they are much more accurate in terms of star positioning. Most printed versions today are computer-generated, and modern telescopes include finder systems where a star or deep sky object can be found automatically using the telescope's own computer. Although today's printed star maps are less beautiful and artistic than those of centuries past, they are more suitable to modern day astronomy.



**Figure 9.** Chart 22 from the 11<sup>th</sup> edition of *Atlas Celeste* by Dien and Flammarion, published in 1904. 23.8 X 33.9 cm. Note the absence of constellation images, although there are lines connecting the main stars of the featured constellations (like Orion in the upper right corner). Note also the presence of loose and curvy constellation boundaries, a plethora of stars based on telescopic observations, and a very detailed coordinate system.



**Figure 10.** Chart 11 showing Orion, from the 1981 1<sup>st</sup> Deluxe Edition of Tirion's *Sky Atlas 2000.0*, the first atlas plotted for the epoch of 2000 A.D. 31.1 X 45.4 cm. Note the absence of constellation images or lines, the presence of rectilinear constellation boundaries, stellar magnitudes indicated by clear variations in the size and design of the star images, the Milky Way indicated in blue, and an insert on the left showing the Orion Nebula. Courtesy of Sky Publishing Corporation.

**Dr. Nick Kanas** is Professor Emeritus (Psychiatry) at the University of California, San Francisco. He is a past Northern Vice-President of the California Map Society, and he has collected antiquarian celestial maps and books for over 35 years. He has published articles and given talks on celestial cartography, and he has written two map-related books: *Star Maps: History, Artistry, and Cartography* (now in a hard-bound 3<sup>rd</sup> edition) and *Solar System Maps: From Antiquity to the Space Age*. Unless otherwise stated, all images in this paper are from the Nick and Carolyn Kanas collection.

# TEACHING ASTRONOMY IN THE 1800'S

CHRISOPHER W. LANE

First appearing in 1848, and then published regularly over the next two decades, *Smith's Illustrated Astronomy* provided public school students with "all distinguishing principles in physical Astronomy with as few words as possible" in a widely available celestial atlas "at a much less price than have been given in any other elementary Astronomy." The atlas, containing twenty-eight wood engraved celestial charts, along with fifty-four separate lessons composed of a series of questions and answers and several essays, (Fig. 1) was written and designed by Asa Smith, identified as "Principal of Public School No. 12, City of New York."

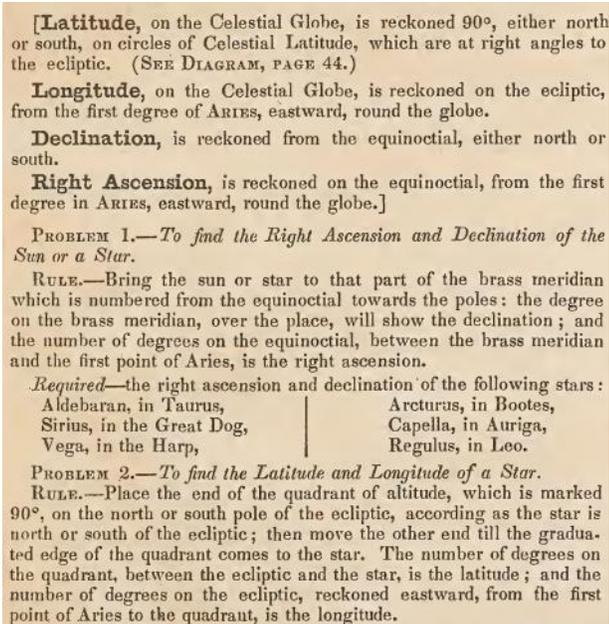


Fig. 1 Detail of a problem in astronomy using the "Celestial Globe" from page 66 of *Smith's Illustrated Astronomy*, Cady & Burgess, 1849.

The first record of Asa Smith is in the New York City Directory for 1838-39, where he is listed as a "teacher" in the Chelsea section of the city, the area where he lived and worked at least until the early 1860s. Smith was very involved in improving the education of students in "Public or Common Schools," and, in 1845, was one of the authors of *A Plan of Instruction for the New York Public Schools*. By that time, he had become the Principal of Public School No. 12, later called Ward School No. 11.

Astronomy was his particular interest, and, in December 1839, he drew a manuscript chart of the "Eclipse of the Sun. 1846. April 25<sup>th</sup>," which was engraved and printed that year,

and was accompanied by a broadside which explained how the chart was to be used. This colored chart, "Calculated and Drawn by A. Smith," shows the western hemisphere overlaid with a black circle, representing "the moon passing between the earth and sun," along with a red circle, representing "the sun partly eclipsed by the moon."

The chart and broadside are very rare, which might indicate that they did not sell well, but, apparently undeterred, Smith produced a comparable chart in 1860 for the eclipse which was to occur on July 18<sup>th</sup> of that year, this time with the text printed on the same sheet as the diagram. (Fig. 2) By then, Smith was identified as "Former Principal of Public School No. 12," and took it on himself to promote this broadside. Attached to a copy at Harvard University is a note which he sent along with the chart:

*Mr. Editor: I take the liberty of sending you this Diagram, presuming you are interested in all subjects designed to instruct and elevate the minds of our fellow men. I would be pleased to have you notice it editorially, and you can make such use of this in bringing it to the notice of your readers.*

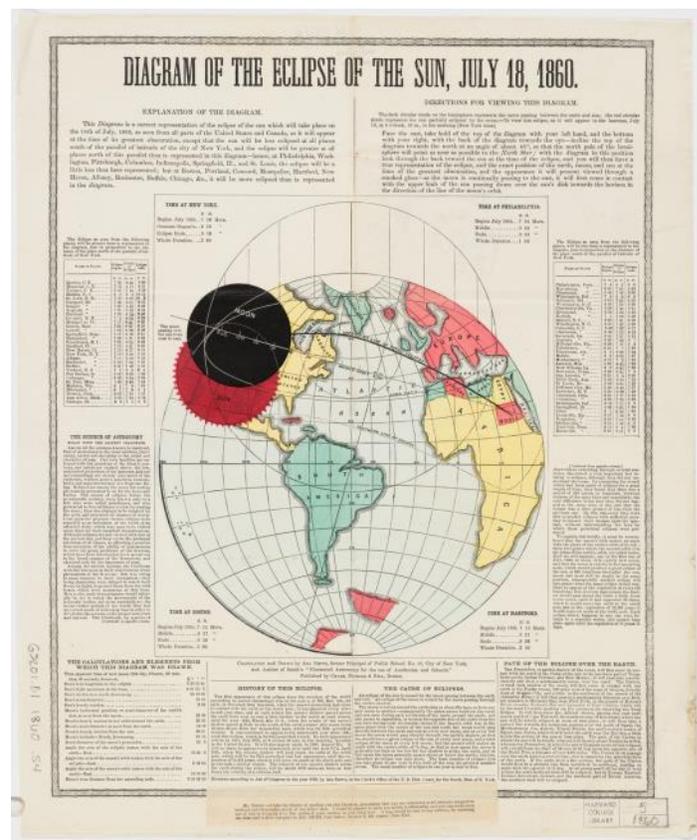


Fig. 2 "Diagram of the Eclipse of the Sun, July 18, 1860." Broadside created by Asa Smith and submitted to Harvard University. Image courtesy of the Harvard Map Collection, Harvard University.

[Images, except as noted, are courtesy of the author]



attractive, but also an effective teaching tool, especially for younger students. Smith claimed that these “ocular demonstrations ... shall make the subject easily understood.”

In the history of celestial charts, there are few series done in this manner. This can at least partly be explained by the difficulty of producing “reversed” illustrations, where the details are in white and the background black, a process which generally requires either intaglio (such as engraving or etching) or lithography. However, “reversed” illustrations can more easily and effectively be done with wood engraving as a relief method, as demonstrated by the Smith illustrations.

Smith’s atlas was extensively advertised in newspapers in New York, New England and the Midwest, with accompanying text suggesting that “Teachers and School Committees are requested to examine the work,” as “The plan is so simple and illustrations so complete, together with the beautiful style in which it is got up, that it cannot fail of an extensive introduction.” (*New York Tribune*, August 11, 1848).

The atlas proved to be very successful and was issued in regular editions as late as 1868. In the 1855 edition, he writes, “The favor with which this work has been received by teachers and the public generally has far exceeded the author’s expectations, it having run through fifteen Editions since its publication.”

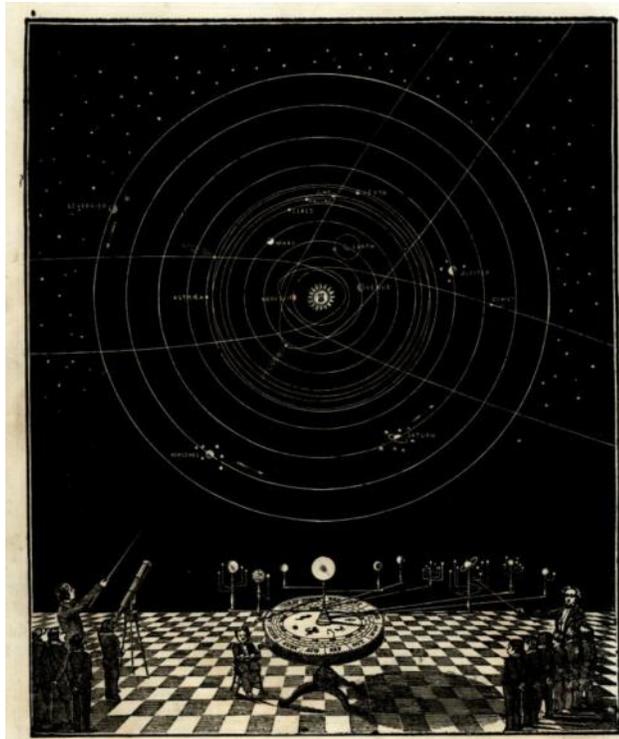


Fig. 6 A dramatic plate showing Smith’s pedagogical focus. (p. 1)

Smith updated his diagrams and lessons over time, and also added new charts in order to accurately reflect current knowledge for students. As he states in the preface of the “Revised” edition of 1868, “It has been thoroughly revised, and the *new* discoveries are brought up to the present date; five new illustrations have been added, and a new set of *Electrotype plates* have been procured at a great expense, which give a very distinct and beautiful diagram.” (Fig. 6)

Some of the later editions of the atlas include an endorsement and testimonial by Simon Newcomb, Assistant to the U.S. Nautical Almanac, that:

*I have carefully examined the revised edition of Smith’s Illustrated Astronomy, and find it fully brought up to the present state of the science, and more accurate in its details than any other elementary work on the subject with which I am acquainted. The plates are admirably calculated to interest the learner, and give him a clear idea of the celestial motion.*

Smith designed and produced several versions of the atlas, including an abridged version “Designed for the Use of Junior Classes in the Public Or Common Schools in the United States,” first issued in 1849. and published in a smaller size, with ten simplified diagrams and 49 question-and-answer lessons.

At least two foreign language editions were issued. About 1850, *Der Bau des Himmels, oder anschaulichste Darstellung des Weltsystems in Bildern. Für Schulen und für Freunde der Astronomie* [The construction of the sky, or most vivid representation of the world system in pictures. For schools and friends of astronomy] was published in German. Of particular interest is a Spanish language edition, *Astronomía Ilustrada de Smith: Dispuesta para el uso de las Escuelas Públicas ó Comunes de los Estados Unidos* [Smith’s Illustrated Astronomy: Available for use in the Public or Common Schools of the United States], which was published in New York in 1860. This title specifically indicates that the atlas was intended for schools in the United States and it is most interesting that in 1860 Smith was aiming a publication at Spanish speaking students in this country.

**Christopher W. Lane** is the owner of The Philadelphia Print Shop West in Denver, Colorado. Chris has been in the antique map business since 1981, lecturing around the country and overseas, curating museum exhibitions, and has written several books, as well as numerous articles. Mr. Lane also appeared as a map and print expert on *Antiques Roadshow* for over two decades.

# TREASURES FROM THE GEOGRAPHY AND MAP DIVISION THE LIBRARY OF CONGRESS

JULIET ROTHMAN

There are over 6 million objects in the Library of Congress' Geography and Map collection, which include maps, globes, atlases, and a variety of other related items. Of these, 35,000 are available for viewing, research, and study online. The Library's *Ask a Librarian* website offers free digital copies, responds to questions, and connects the public with collection resources. It was interesting to learn that the Philip Lee Philips Society of the Library was the first group to actually purchase maps for a public collection, such as the one in the Library of Congress. This early decision has enabled the Library to amass its very impressive collection. I was fortunate to be given a private tour of several of the most special and interesting objects in the collection by Ryan Moore, Cartographic Specialist.

We began our tour with two very special globes: Teddy Roosevelt's, and FDR's, prominently displayed near the collection entrance with their portraits. The first people who could afford to have globes made, Ryan shared, were kings and



heads of state, whose knowledge of the world was essential to their ability to govern and to achieve their nations' interests. Through history, globes have been an essential item for rulers, prominently displayed in offices and reception areas. Thus, each globe reflects both current geographical knowledge and political divisions between peoples at the time of its creation. FDR's globe (Fig. 1) was one of a dozen globes created in 1942, during World War II, by the forerunner agency to the CIA. They were distributed to FDR, the Army Chief of Staff, the Speaker of the House, and to Winston Churchill as well. It was essential to the war effort that the leadership utilize identical globes, so that planning could be detailed and accurate. For example, these globes were used to determine desti-

nations and distributions of supplies by land and sea. Reflective of the political borders existing in 1942, the globe does not include Austria or Czechoslovakia, which the Anschluss had unified into a greater German state.

Not surprisingly, the Library also contains the original plan (Fig. 2) of Washington DC, by Charles Pierre L'Enfant. He drew his inspiration from Versailles, and created areas for fountains and for statues similar to the French palaces and cities. The original design was disputed, kept getting revised, and L'Enfant was actually fired by the government. Andrew Ellicott was then hired, and it was he who completed the revisions and changes and whose design was finally adopted. At the time, each county separately determined their location as related to the prime meridian, which was the physical location of the Congress. Of course, this system created disparities between the counties, so that early maps of the area were often in conflict over the coordinates! (<https://www.loc.gov/item/88694205/>).

The collection contains a very rare Aztec map, (Fig. 3, next page) begun in the year 1290, which also traced genealogy and land ownership along both male and female lines between 1480 and 1593. Its provenance in itself is interesting: it began in the hands of a London dealer, Alexa Cavera, who died in 1904. It was later owned by Hearst, who then placed it for



auction at Sotheby's. There, it was purchased by a Parisian dealer. When the dealer died, he left the map to the French Biblioteque Nationale, who, for some unclear reason, refused it! The dealer's 99-year-old partner then sold it to the Library of Congress' collection.



In discussing maps of the Americas, Ryan raises an interesting point: how did the Spanish priests communicate with people who spoke a variety of local languages, including Quechua and Iza (now extinct)? How did they pronounce the words and place names that appear on maps? The answer—priests wrote and communicated in the language the same way that they heard it—phonetically. They recorded their voyages, described events and people, and placed names on maps according to what they *heard*. So, they *listened* to Quechua, for example, and *heard* Spanish. This resulted in Spanish-sounding native names for locations placed on maps!

Another very special map was a delicate scroll map of the Tokaido Road in Japan. The Tokaido extended from Edo (now Tokyo) to Kyoto. This beautiful pictorial map (Fig. 4, one of 13 segments) was drawn with pen and ink and enhanced with watercolor. (<https://www.loc.gov/item/2002531180/>)

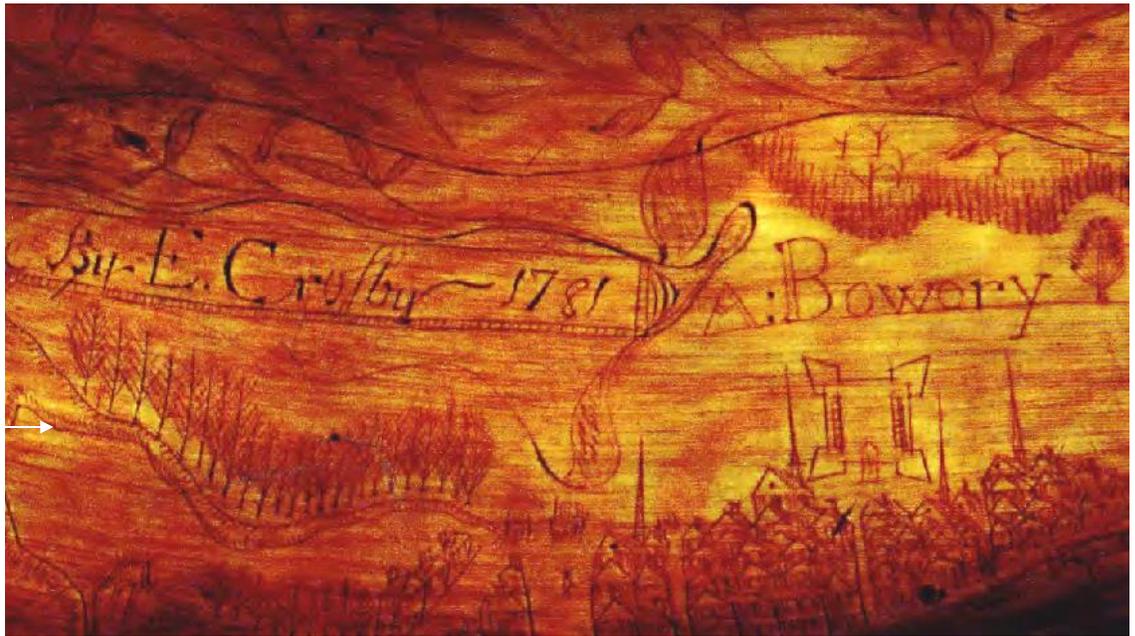
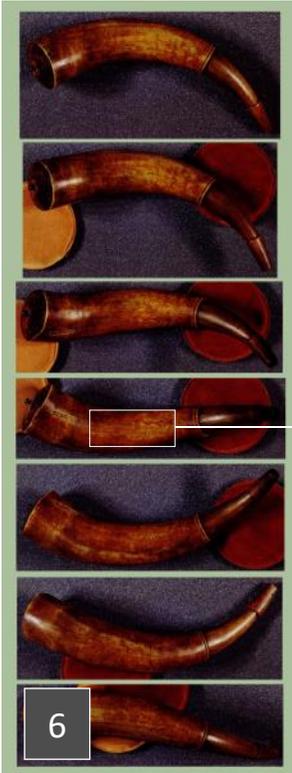
There are a number of Portolan charts in the collection as well. One of these, drawn on vellum, (Fig. 5) shows the Pacific coast of South and Central America, and includes the Galapagos islands. Dating from between 1540-1560, it appears to have been created shortly after Pizarro's conquest of Peru.

Ryan showed me a set of powder horns with maps cut into them, black lines and designs on cream-colored horns. These engraved horns (Fig. 6, next page) created in 1781, show Yorktown and the York River, and also Moore House and Garden, where the surrender actually took place—a truly significant piece of American history! (<https://www.loc.gov/item/2007632271>)

Still another was a beautiful collection of globes cut into two hemispheres. (Fig. 7, next page) These were small, and delicate, and most intricately drawn and colored. Ryan pointed out an especially unusual set in the collection: while most globes were hollow, with maps drawn on the inside of them, one was simply a round ball sliced in half, with maps drawn carefully on each flat half. The degree of intricacy on these globes was truly amazing! Two examples: a delicate terrestri-



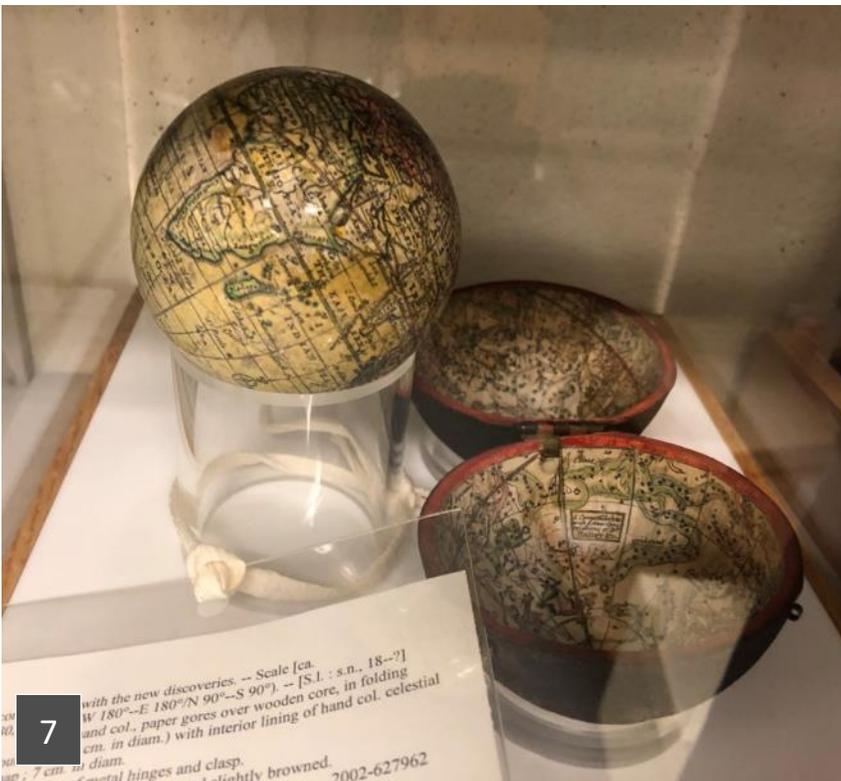
al globe by the Holbrook Apparatus Mfg. Co., in two hemispheres hinged together is especially interesting because "Russian America" can be found in Alaska, and another globe



whose wooden core shows a terrestrial map on the outside, and a celestial one on the inside when opened.

A remarkable World War II atlas in the Library's collection is the bound series of maps which were used by Hitler himself

21. Juni – 6 Dezember 1941, it is a collection of 121 folded leaves of maps (Fig. 8, next page) of the lines between the German and Soviet armies during the 6 months between June 21 and December 6, 1941. The maps, sequenced by dates, clearly illustrate the rapid progress of the German armies, and also define areas where Jewish towns and populations were destroyed. (<https://www.loc.gov/item/map51000141/>)

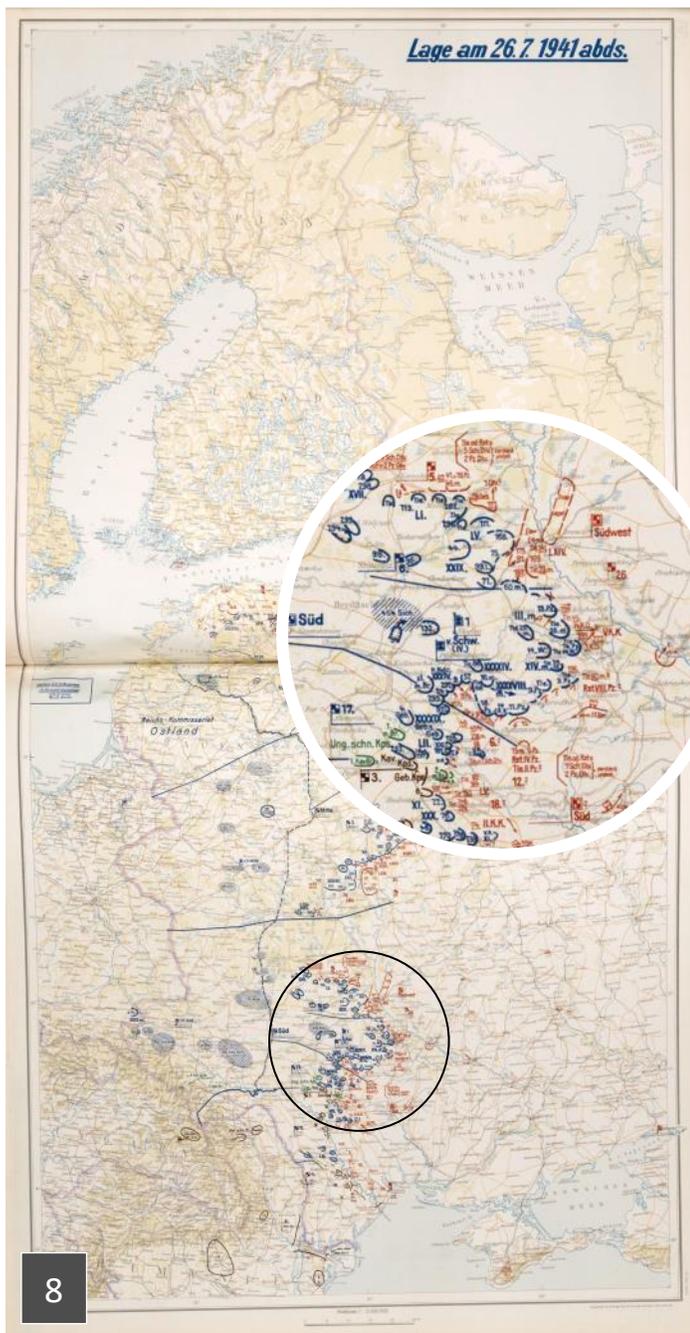


7 with the new discoveries. -- Scale [ca. W 180°--E 180°/N 90°--S 90°]. -- [S.L.: s.n., 18--?] and col., paper gores over wooden core, in folding cm. in diam.) with interior lining of hand col. celestial map; 7 cm. in diam. of metal hinges and clasp. slightly browned. 2002-627962

during his campaign in Russia. Titled *Die Feldzugagen Sowjet-Russland: Band I. Operationen Sommer-Herbst 1941 vom.*

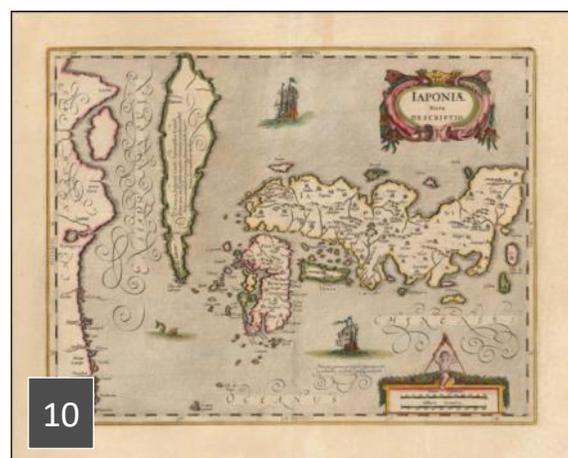
Donated to the Library by Charles Burwell, who had been an intelligence officer in the Navy during World War II, the Library has a 47" by 47" three-dimensional map of Utah Beach, (Fig. 9, next page) site of the invasion of Normandy. The relief map made at the very last possible minute for up-to-date accuracy, was created from data obtained by low-flying American pilots, who made stereo pictures during flights. Created and assembled at Camp Bradford, in Virginia, it included tidelines, degrees of slope, buildings, and obstacles planted by the Germans to forestall landings. The map was used in planning the D-day invasion, and in determining the optimal conditions and locations for landings by Eisenhower, Montgomery, and other officers. The story of the map, and a digitized version, can be accessed at <https://www.loc.gov/loc/cib/0304/rubber-map.html>.

Another very special map in the collection is Jan Janssen's 1650's map of Japan. (Fig. 10) Ryan especially wanted to share this map with our members because of the early charting of California as an island. Here, Korea is also erroneously depicted as an island. On



above the water, blues for areas that experience tides and have tidepools!

This small, but very special sampling truly whets the appetite for more! Visitors are always welcome, and digital resources can easily be accessed online.



a more local note, the Library has an impressive collection of digitized maps of San Francisco, which can be accessed at <https://www.loc.gov/maps/?q=san+francisco>

A very unusual and very dramatic three-dimensional map of the Crown Prince Islands, off Disko Bay in Greenland (Fig. 11) was created by Silas Sandgreen, an Eskimo hunter. The flat part of the map is on a sealskin over bare wood, and illustrates the seas around the islands. Each island was very carefully carved from pieces of driftwood in an accurate size and shape, and is attached to the sealskin. The islands are black and various shades of blue: black for areas that are always

## NOTABLE EVENTS AT THE DAVID RUMSEY MAP CENTER IN 2019-20

April 25, 2019, **Coordinates: Maps and Art Exploring Shared Terrain** | Exhibit Opening and Symposium of talks | Exhibition dates April 25 - September 30, 2019. The exhibition featured a variety of ways in which maps and art, two porous mediums, overlap in inquiries about space, both geographical and metaphorical.

October 10-12, 2019 **Barry Lawrence Ruderman Conference on Cartography 2019: Gender, Sexuality, Cartography.** Topics included mapping sexual practices in French Vietnam, women in American cartographic history, the gendered cartographic language of medieval texts, the digital mapping of queer spaces, and much more. Often controversial, these talks engendered a lively exchange of viewpoints from audience members. The keynote speaker was noted author Susan Schulten who shared her research on the pioneering female mapmaker Emma Willard.

October 25, 2019 **Geoffrey Oliver Lewis: Maps as Mirrors and Methods of Colonialism in Hawai'i:** California Map Society Essay Competition Winner Presentation. Mr. Lewis concluded that “... *Europeans and American missionaries would continue to observe, learn from, mold, and ultimately change Hawai'i into an extension of their western vision in an attempt to erase Hawaiian culture from the cartographical lines of a map.*” This essay appears in its entirety in this issue of *Calafia*.

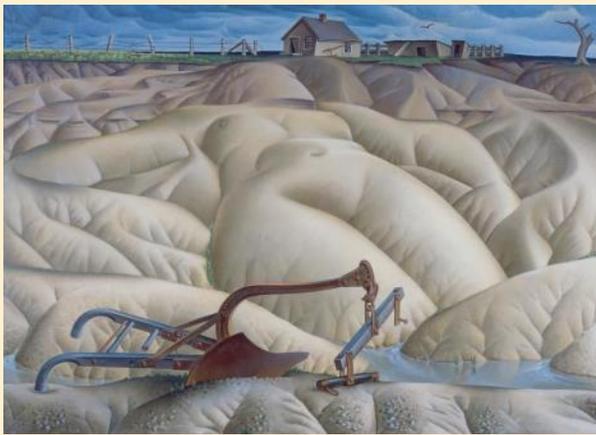
December 10, 2019 **Was Leonardo da Vinci's World Map the First to Name America?** A Talk with Christopher Tyler. Dr. Tyler convincingly posits that da Vinci, not Waldseemüller, was first to depict the placename *AMERICA* on a world map.

February 10, 2020 **Info We Trust: How to Inspire the World with Data.** Learn how to make maps, charts, and diagrams people can believe in with data storyteller RJ Andrews. RJ provided a special focus on design lessons from the history of thematic mapping—lessons that still help us improve how we see the world.

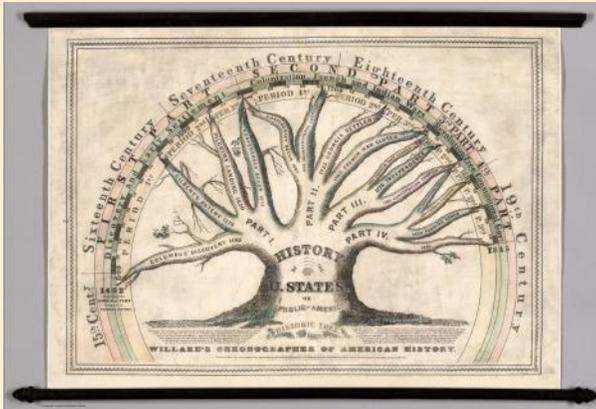
**More info:**

<https://library.stanford.edu/rumsey/events>

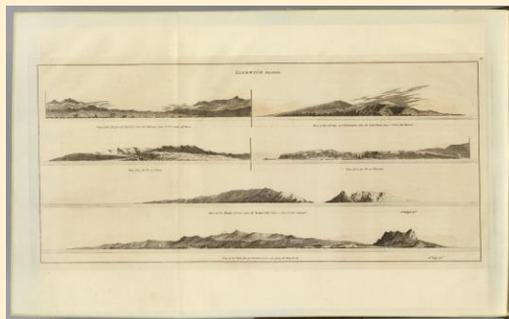
Alexandre Hogue, *Erosion No. 2, Mother Earth Laid Bare*, 1936. Image: [Curiator.com](http://Curiator.com)



Emma Willard, *Willard's Chronographer of American History*, 1845. Image: [Davidrumsey.com](http://Davidrumsey.com)



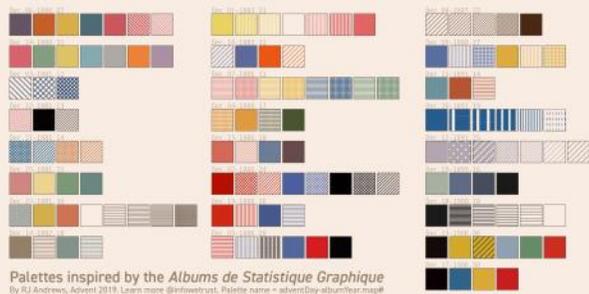
Captain James Cook & William Bligh, *Six engraved coastal views of the Sandwich Islands*. G. Nicol and T. Cadell, 1785. Image: [Davidrumsey.com](http://Davidrumsey.com)



Detail from *Da Vinci's octant world map projected onto Reuleaux triangles* (~1508). Image: Royal Library, Windsor, UK



*Palettes inspired by the Albums de Statistique Graphique*, from *Classic Map Color Design*, RJ Andrews, *Info We Trust*.



# BAM MEETING

SEPTEMBER 14, 2019

JULIET ROTHMAN

The BAM (Bay Area Map Group) met on a sunny Saturday at the lovely home of Ron and Jane Gibbs, which overlooks a canal filled with picturesque houseboats in San Francisco's Mission Bay. Fourteen people shared maps and views and delicious refreshments on a lovely afternoon.

The Gibbs home holds an amazing collection of beautifully framed, antique historic maps in every room. Jane says that their choice of home was actually determined by the size of the walls, which needed to be able to display all of their beau-



tiful collection. Ron led the group on a tour of some of his favorites. One area of Ron's collection is maps of New York, especially during the Revolutionary War. He began his tour with a story: One of his favorite maps is a large 1770 John Ratzler map of New York City, (Fig. 1) which they had purchased there. The Gibbs were in New York visiting friends and preparing for a trip to the Middle East—and then—9/11 happened! The trip was delayed, the World Trade Center was gone. When the Gibbs were finally able to get on a plane, the World Trade Center was still smoldering, and Jane took a photo from the airplane of the smoke from the destroyed buildings. The photo hangs next to the Ratzler map. Ron also has a map of Washington Crossing the Delaware and of the Battle of Brooklyn, as well as one of upper Manhattan which includes the Fort to which Washington's forces retreated in November of 1776—a fort they were only able to hold for 5 hours before surrendering it to the British!

Ron's collection includes a Dutch copy of Henry Popple's Map of the British Empire, with sea battles, winds—and a Native American Queen with her foot on the head of a decapitated European with an arrow in his head. A 1750 Herman Moll world map (Fig. 2) illustrates the world known to Europeans at



the time, with California as an island, and little or no details on northwestern North America, northeastern Asia, only 2/3 of Australia. A 1777 John Mitchell map in Ron's collection is said to be the most important in American history because of the degree of detail it includes. In fact, the English version of this map was actually used at the Treaty of Paris to define the borders of the United States!

Several members also brought maps to share with the group. Austin Arensberg began his presentation by sharing an important thought for all of us to ponder: maps depict a moment in time, and that moment is impermanent. He focused on geological changes by sharing a copy of Harold Fisk's 1944 map of the "Geological Investigation of the Alluvial Valley of the Lower Mississippi River," published by the US Army Corps of Engineers. The map includes the course of the Mississippi from Cape Girardeau to Donaldson, LA. Data for the map was obtained through the challenging and laborious task of making multiple borings to determine the types of soil and rock formations under the surface to determine the changes of the river's flow through the ages.

Mary Holder shared that she has been involved in politics around the building and maintenance of a park and open area in her Forest Hill community. At a public meeting on the subject (attended by only 3 community members!), the city government gave out swag: a bright orange folding cloth shopping bag with a MUNI map on it! She then graciously gave the bag to the Gibbs to thank them for hosting our BAM meeting!



In honor of the meeting at the Gibbs, in their Mission Bay home, Fred DeJarlais shared that he had spent almost two decades of his professional career working with urban planning in Mission Bay. In the original documents of the area, much of the Mission Bay land had Public Trust status. This restricted development to maritime-related uses. Fred was instrumental in reconfiguring the trust to allow other uses for land in the area. He used historic maps (Fig. 3, Salt Marsh & Tide Lands Map No. 3) to show the original shorelines, maps of which he shared with the group. Geological maps illustrate that the area is composed of 100-175 feet of “Bay Mud”, an alluvial, super-saturated, compressible, such that buildings in the area must be constructed on piles.

Fred Auda shared two very different, but very interesting kinds of maps: following his own interest and experience in drawing his own maps of his routes of travel, the first group were from an article in Time Magazine. They were hand-drawn maps made by current refugees and immigrants of their routes. One traced the route from Syria to Turkey, another the route north from Guatemala, bringing the experiences of the map creators to life in a very special way. The second set of maps were silk maps carried by World War II airmen. These were meant to be used should airmen be forced to abandon their flights over water, as the water would have destroyed the paper maps,



while maps printed on silk would survive. Fred also shared a map of the deepest gorge on earth, the Kali-Gandaki Gorge in the Annapurna range, and some of his adventures hiking in the area.

Mary Ann Hinckle shared a folding pictorial map of the then-new Pan American Highway. (Fig. 4) It includes not only the bus traveling the highway, but also a detailed illustration of all the plants and animals to be found on both continents. These are carefully described in detail on the reverse of the map, published by the American Geographical Society.

Our last presenter, Leonard Rothman, brought two maps from his Holy Land Map Collection to share. During the 1500’s, the principal antique map publication center in Europe was in the



city of Antwerp, in Holland. It was there that Abraham Ortelius created the first modern atlas, and also a geographic historical atlas. Maps produced during this period were colored by young girls. This map, (Fig. 5) produced in 1595, illustrated the travels of Abraham. It was colored in light pastels, and is surrounded by round vignettes illustrating the life of Abraham, and is the progenitor of Dutch decorative cartography. Pastels were the typical colors of Antwerp, and were used in maps produced in that city. In contrast, Leonard shared a 1607 Holy Land map by Petrus Plancius. In this map, the vignettes are squared, not rounded, thus filling in the space around the map almost completely. It is not colored, and has so much detail that Leonard thought Plancius might have chosen to leave it uncolored so that the detail would not be affected.

The lovely afternoon ended with a discussion of the upcoming San Francisco Map Fair. Three members of the BAM group, Nick Kanas, Fred DeJarlais and Leonard Rothman, will be presenting at the Map Fair. The next BAM group meeting will be held in early December, place and date to be determined.

# SAN FRANCISCO MAP FAIR—2019

JULIET ROTHMAN

The San Francisco Map Fair, held at the end of September, moved its venue this year to the very inviting, bright, and spacious Forum at Yerba Buena Center for the Fine Arts. Seventeen dealers brought a profusion of maps and atlases from every period in history, as well as bright posters, prints, and other map-related materials. Co-sponsored by the *History in Your Hands Foundation* and Sammy Berk, the SF Map Fair's founder, the three-day event included lectures and exhibits.

A stroll through the dealers' maps on exhibit led to many special finds, and I share a few of them here. I was immediately drawn to a set of six map panels in Chinese at Kevin Brown's Geographicus exhibit. Created in 1892 as a humorous New Year's map, this *Map of the World* (Fig. 1) was the first Chinese commercial map. Based on the "blue map," a tax



map of China created in 1815, the map includes the original tax markings over certain sites and areas. Though it has a world-inclusive title, Kevin notes that 90% of the map features mainland China. Some of the islands have unusual names: Africa, for example, is called "Land of the Black Ghosts," while Holland is "Land of the Red Beards." Australia is not included on the map. Two original plates were recently uncovered in the workshop where the map was initially created, which is almost 300 years old and still actively produces maps!

At New World Cartographic, Sammy Berk shared one of his favorites, a map very relevant to the climate change discussions of today. *Atmospheric Perils of the 1930s* (Fig. 2) provides a colorful and vivid picture of the climate in those years. It includes areas that were always pack ice, and areas of winter pack ice, which then approached the southern tip of



South America, temperatures, summer fog areas, and other features. Thunderstorm patterns and frequency are noted by the size of black dots, while red lines indicate the "preferred" tracks of tropical storms. Sammy could trace the pattern of the recent tropical storms off the coast of Florida—they had followed a track already noted in the 1930s! Sammy chose this as his favorite because he loves environmental issues—he had majored in Environmental Sciences in college!

The Vintage Map Shop, which produces fine prints of antique maps, is a recent Sammy Berk creation. He became aware of the need when cartographic aficionados and students would express interest in, and desire for, a particular map, but be unable to purchase it due to size, price, or unavailability. In such cases, a fine print reproduction, which can be varied in size, might be the perfect resolution! Sammy also sends map prints to schools to use as instructional tools.

Chris Lane, at The Philadelphia Print Shop West, had a stack of celestial maps, all matted, all with white lines and marks on a black background. This immediately caught my eye, as I knew that this current edition of *Calafia* would feature celestial maps. Chris shared that they were all from an 1851 atlas by Asa

Smith, the principal of a New York public school. *Smith's Illustrated Astronomy, designed for the Use of the Public or Common Schools in the United States*, was designed to instruct students on what they might see when looking up at the night sky. Chris graciously agreed to write an article on Smith's work, which is included in this journal.

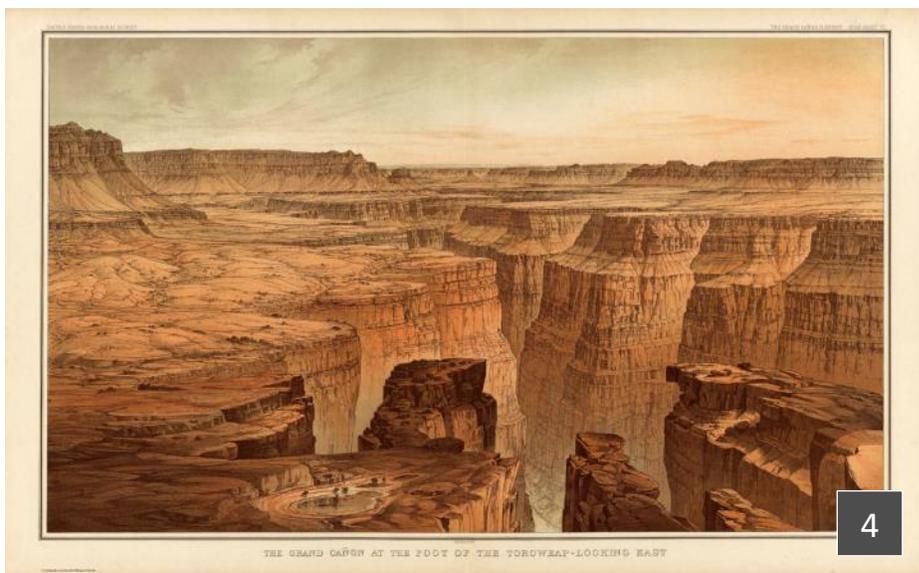
My eye was immediately drawn to a small red leather book entitled *Folding Atlas of the United States* on display by Fred Baron of High Ridge Books. The very rare collection of 15 maps, all neatly numbered and intact, was created in 1826. These same maps were more commonly found in a standard size atlas. Fred carefully opened two of these to show me this treasure—and I hardly dared to touch them, so delicate and fragile, yet perfect, were they. Another rare book, the *Californian Tourist Guide*, printed in 1887, also includes maps of various areas of California.

When I asked Michael Jennings of Neatline Antique Maps to share his most unusual map, he did not hesitate and pointed right to a map of the Bay of San Francisco, a 1930's very brightly colored Art Deco pictorial map of the East Bay. (Fig. 3) It features historical vignettes along the bottom, and centered at the top of the map are lines from a poem by George Berkeley— "Westward the course of Empire takes its way, The first four acts already past, A fifth shall close the drama with the day, Time's noblest offspring is the last." Then, it was decided that Berkeley would be the perfect name for the East Bay city formed in the areas depicted on the map.



Barry Ruderman especially enjoyed a satirical Swedish map lampooning Ronald Reagan, whose politics the artist obviously didn't like. It purports to represent Ronald Reagan's worldview. A few samples: Texas has "traffic controls" for human trafficking, the North Pole is a "good thought" for a Palestinian homeland, the South Pole is Lech Walesa's "homeland," Vietnam is "Viet-Cong", with crosses scattered about, and a note saying "sad story", India is named "Indira", Australia, originally "Austria", with the Austria crossed out, South America is named "United Fruit", with a uniformed officer and a note saying "democratic military dictatorship." The map has a prayer in the upper left corner: "Our Father, who art in Washington, Ronny be thy name . . .".

Ken Sanders of Ken Sanders Rare Books displayed an atlas, *The Tertiary History of the Grand Canyon District*, by Clarence



Dutton, one of two atlases produced by Dutton from information gathered when he accompanied John Wesley Powell on his expeditions. (Fig. 4, plate from the atlas) It contains a series of delicately colored maps and several panoramas of the Grand Canyon. Two of these had human figures, and Ken said that human figures were often used in panoramas to denote scale. Other panoramic views had trees that could be used in the same manner—to give a sense of perspective. Ken had another unusual map in his exhibit: a map of Mexico, Texas, and California by Heinrich Klapert, which included the Mormon state of Deseret. This map is very rare—the state of Deseret existed for only two years—from 1849 to 1851. It had been proposed by Mormon settlers but was never recognized by the United States government.

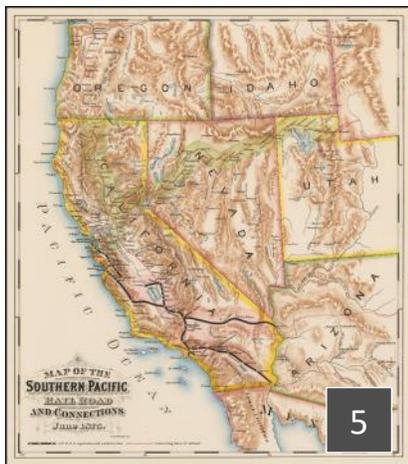
An unusual approach to map collecting is Curtis Bird's of the Denver's Old Map Gallery, whose interests focus on "the frontier of map collecting"—on "what's important in the 20th cen-

ture—biotech, science, and technology, space exploration." His gallery is especially dedicated to space exploration from both the American and Soviet experiences, as well as those of other nations. One of his treasures is the first photo of earth from deep space, and this amazing story can be found here in the journal. Curtis is also interested in maps of the ocean floor, given that 70% of our planet is covered in water, and much remains unexplored.

A 1929 nicely bound folding transcontinental flight map on display at James Arsenault and Co. was issued to passengers on Transcontinental Air Transport, which later became TWA. Especially interesting was the indication that stretches of train travel alternated with flights across the country—although there was commercial air travel, it obviously didn't extend coast to coast. Vignettes of sites along the way prepared travelers for their various stops, and the reverse held additional information as well as a "Certificate of Flight."

For the brand-new map dealer, Curtis, of Curtis Wright Maps, this was a first Map Fair! He was thrilled by be attending and had brought some of his favorite maps and posters. His very favorite is the "Home Alone" movie poster of the inside of the house, with all the booby traps. This had been his favorite movie for years. The map was originally distributed for free to purchasers of the film's VHS.

Harry Newman from the Old Print Shop shared a Map of the Southern Pacific Railroad and its Connections, created in June 1875. (Fig. 5) This rare promotional map shows the railroad connections between San Francisco and Los Angeles, which were, it notes, "in operation and construction." The first train from San Francisco actually arrived in Los Angeles in 1876. Black lines denote existing, functioning railroad, while broken red lines are areas not yet built. This was the earliest known map focused on the Southern Pacific Railroad.



Five interesting lectures gave attendees insights into several special aspects of collecting. Leonard Rothman presented some ancient manuscript maps of the Holy Land along with keystone exemplars from his collection with dates ranging from Ptolemy's work, around 160 CE to the Arbuckle Holy

Land maps of 1877. He showed that Holy Land maps were often created from one of two perspectives: with North at the top, based on the original orientation of Ptolemy, or with East on top, from the perspective used by Petrus Vesconte. (See Fig. 6, Abraham Ortelius, Pilgrimage and Life of Abraham the Patriarch, 1595)

Nick Kanas gave two lectures on Celestial Maps. The first, on Classic Antiquarian Maps, focused on helping attendees to un-



derstand some celestial mapping criteria: cosmological maps, which focus on the solar system, follow either the path of the ecliptic or that of the equator, while star maps, can be either geocentric (looking up from earth) or external (looking down from the heavens). He also shared some history of celestial mapping. His second lecture presented maps used in frontispieces and pictorial maps, which became popular in the 20th century, and focused on symbolism, artistry, and the emotions rather than the accuracy and detail which were central to earlier celestial mapping efforts.

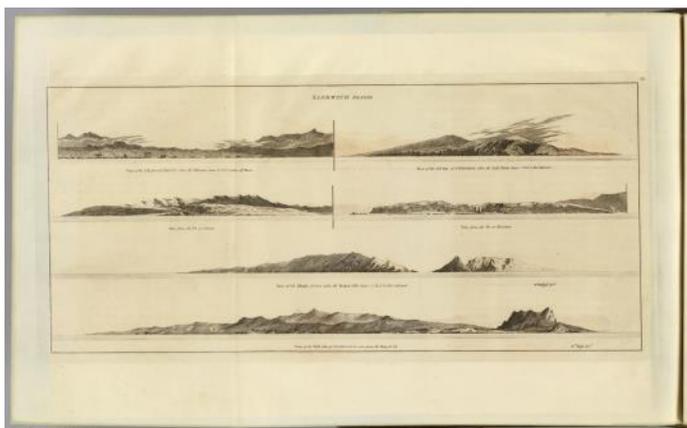
Christopher Tyler's special interest is in the maps created by Leonardo DaVinci, a cartographer who used new and creative methods in his work. The presentation focused on DaVinci's world map, currently in the Royal Library in Windsor, which has the correct configuration of the continents and poles on 8 spherical-geometry triangles. He argues that there is evidence that DaVinci's world map is the earliest to name "America", contrary to the generally accepted attribution to Waldseemüller. Fred DeJarlais's presentation focused on the efforts to partition California into several states, which began with the Constitutional Convention of 1849, and continue today, and include cartographic renderings which suggest potential points of division. These ongoing efforts highlight the ongoing demographic, economic, cultural, and environmental variations in different areas of the state.

The San Francisco Map Fair is the largest map fair in the western states—well worth a trip for non-residents. Watch "Mapping Here and There" in *Calafia* for next year's dates.

# MAPS AS MIRRORS AND METHODS OF COLONIALISM IN HAWAI'I

GEOFFREY OLIVER LEWIS

Geoffrey Oliver Lewis is the recipient of a student paper award that is co-sponsored by the David Rumsey Map Center at Stanford University and the California Map Society.



**Fig. 1** Captain James Cook & William Bligh, *Six engraved coastal views of the Sandwich Islands*. G. Nicol and T. Cadell, 1785 Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.

## Introduction

The map titled *Sandwich Islands* (Figure 1) by Captain James Cook (1728 - 1779) and William Bligh (1754 -1817) shows illustrations of the islands of Mau'i, O'ahu, Hawai'i, Kaua'i, and Ni'ihau as seen from their ship. The islands poke out of the ocean like that of an inverted oasis. Clouds cling to a few mountain tops and the islands look as mystical as they look welcoming. There are no people, no housing structures, and no signs of human life. We know this not to be the case, but colonial maps and manipulations of native land rarely tell the whole story, let alone a true one.

Prior to European contact, the Hawaiian people survived on the limited resources of an isolated island chain in the Pacific. This was made possible through communal land ownership, sustainable agricultural practices, and a spiritual connection with the land. However, with the arrival of Captain James Cook and his ship, the *Resolution* in 1778, these ideologies were flipped upside down. Colonization in Hawai'i, similar to that of North America, was brutal. In just over 150 years, Hawai'i would go from an isolated sovereign nation to a U.S. Territory to an actual State. The Hawaiian people, along with their native culture, were nearly eradicated in the process. Disease, Christianity, English education, as well as European governmental control are just a few examples of the cultural

threats experienced by Hawaiians throughout the colonization process.

While the timeline of Western control over the islands is clear through both literature as well as oral history, an analysis of colonial maps of Hawai'i provide detailed evidence of the actual methods used by Europeans and Americans to seize control of Hawaiian land, people, and culture. Colonial maps of Hawai'i act as both tools of colonization as well as a means to tell the story of colonization. By transcribing the Hawaiian language, missionaries were able to educate Hawaiians in western values and, in particular, develop the idea of naming and owning once communal land. Via the American influence of the Hawaiian government, the land was officially commodified. Colonists were able to blur traditional land tenure and remodel it into the developed Hawai'i that we see today. The maps presented in this essay not only mirror the timeline of the colonization of Hawai'i, but also provide us with an insight into the inner workings of the colonists' toolkit of learning, re-imagining, and ultimately, re-inventing indigenous life. Through the use of colonial maps, my analysis tracks the colonization process of the Hawaiian Islands through language transcription, land division, and early depictions of Manifest Destiny.

## Pre-Contact Hawai'i and the Arrival of Foreigners

To understand the impacts of colonization in Hawai'i, it is important to first recognize Hawaiian life prior to European contact. Land in Hawai'i was not seen as a commodity. Instead, the land belonged to the *Akua*, the Gods and Goddesses. This idea is grounded in Hawaiian mythology which tells the story of connection between the Hawaiian people and the land. The *Kalo* plant, the key nourishment of the Hawaiian people, was seen as the older sibling to Hawaiians. It provided them nourishment, protection, and security. Therefore, regardless of hierarchical power, the land was of something higher, something greater than humans beings. To the Hawaiian people, land was kin and it was treated as such.

Despite communal living, there was a distinct hierarchy of power in Hawai'i which divided Hawaiians into three groups. There was the *Mo'i*, the king. There were *Ali'i*, the chiefs who regulated different regions within each island. And then there were the *Maka'ainana*, the common people. Hawaiians lived a community-based lifestyle that revolved heavily around agriculture. In some ways, there was a division of land. However, this division was not focused on dividing people by power. Rather, it was focused dividing segments of the island into self-

sustaining regions. These regions were divided into pie-shaped segments of land that ranged from the tip of a mountain down to the edge of the ocean using natural barriers such as mountain ridges. Each individual segment was called an *ahupua'a*. Hawaiians focused on land stewardship and sustainability rather than monetary ownership of land property. Following their arrival, Europeans and American Christian missionaries worked to dismantle these beliefs and this system in order to best fit their ideologies of land ownership.

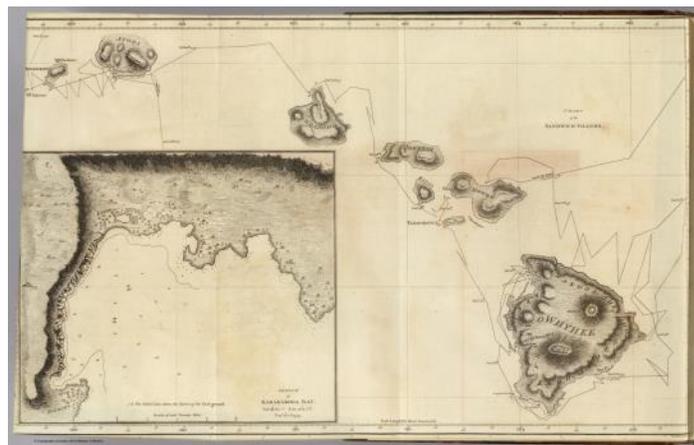
It is Captain James Cook who is credited with the “discovery” of the Hawaiian Islands. He landed in Hawai'i for the first time in 1778 and when he arrived again a year later, he was murdered by the Hawaiians. However, the damage was already done, and the western world had learned about the island paradise in the Pacific. The British were the first to come to Hawai'i and on their boats came disease; diseases never seen nor experienced by the Hawaiian people before. The influx of pathogens hit the Hawaiian nation hard. The rapid and massive decline in the Hawaiian population put stress on the Hawaiian kingdom.

By the early 19<sup>th</sup> century, outsiders began pouring into the islands, the most influential of these figures proved to be American Christian missionaries. As the native population dwindled, so did their indigenous faith. Recognizing this, missionaries began to take advantage of the vulnerable Hawaiian population. Their first step in this process was the transcription of the Hawaiian language. Hawaiians lacked a written language, their medium of communication was the *'olelo*, or spoken language. Throughout the colonization process, it became crucial that the Hawaiian language be transcribed into a written text and it was up to linguists to listen to the Hawaiian language and attempt to transcribe what they heard.

### Transcribing the Hawaiian Language

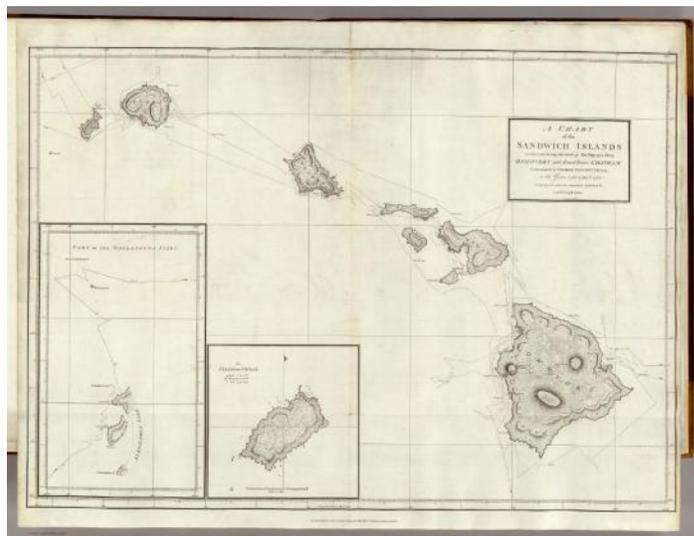
Naming, especially in the form of maps, is a way to objectify a group of people, a space, a belief, and in the case of Hawai'i, an island chain. By labeling names and locations, missionaries were then able to take the first steps towards land ownership in Hawai'i. The map, *Chart of the Sandwich Islands. (with) Sketch of Karakakooa Bay*, by William Bligh and James Cook (Figure 2) shows the early transcription of the Hawaiian language to western ears and script through the cartography of the Hawaiian Islands.

The map was published in 1785, just seven years after the western discovery of the islands. It is one of the earliest depictions of all eight of the Hawaiian Islands and it is understandably riddled with geographic inaccuracies. It is immediately made clear that Bligh's and Cook's transcriptions of the Hawaiian language are, while phonetically similar, quite different



**Fig. 2** Captain James Cook & William Bligh. *Sandwich Islands: Engraved nautical chart with inset of Karakakooa Bay*. G. Nicol and T. Cadell, 1785. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.

in spelling than the Hawaiian written names that were later adopted. For example, *Ni'ihau* is called “Oneehow,” *Kaua'i* is “Atooi,” *O'ahu* is “Woahoo,” *Moloka'i* is “Morotoi,” *Lana'i* is “Ranai,” *Mau'i* is “Mowee,” *Kaho'olawe* is “Tahoorowa,” and the island of *Hawai'i* is called “Owhyee.” The map provides sailing routes and is clearly an aide to the navigation of the Hawaiian Islands by European ships.



**Fig. 3** George Vancouver, *Uncolored maps of the Hawaiian and Galapagos Islands*. G.G. & J. Robinson, 1798. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries

By providing a structure in which to hear and transcribe the Hawaiian language, this map acted as a baseline for future maps of the islands. Maps that followed, such as *Charts of the Sandwich Islands* (Figure 3) by George Vancouver (1757 - 1798), copied the spelling of the island names but made cartographical improvements. This proved true for other maps that

followed up until the adoption of official Hawaiian alphabet in 1826.

The process of translating the oral Hawaiian language into a written one was made a priority by American missionaries. Fortunately for the missionaries, their effort to reduce the Hawaiian language into a written one was greatly assisted by the previous missionary efforts to create a written language for Tahitians. The first printer to arrive in Hawai'i was named Elisha Loomis (1799 – 1836), and it was he who would spearhead the development of the Hawaiian alphabet as well as the push for a western education system. Loomis quickly discovered the difficulty in transcribing the language. Specifically, he had issues with letters like “k” and “t” as well as “l” and “r.” When listening to Hawaiian speakers, the two pairs of letters sounded almost identical. This actually matches the maps made by both Bligh and Vancouver. The “k” and “l” in *Moloka'i* mistaken for a “t” and “r” in Morotai. The “k” and “l” in *Kabo'olawe* was also mistaken for Tahoorowa.

On January 7<sup>th</sup>, 1822, Loomis printed the first Hawaiian spelling primer. It was titled: *Lesson I*. Men and women from across O'ahu came to witness the printing of *Lesson I*. There was an air of “excitement” from both missionaries and Hawaiians alike. However, it was not until the next day that a personal trial was run exclusively for the current King of Hawai'i. Loomis printed out the King's name two times in all capital letters. One read RIHORIHO. The other read LIHOLIHO. The king preferred the second spelling best, and his written name was created: King Liholiho (1797 – 1824).

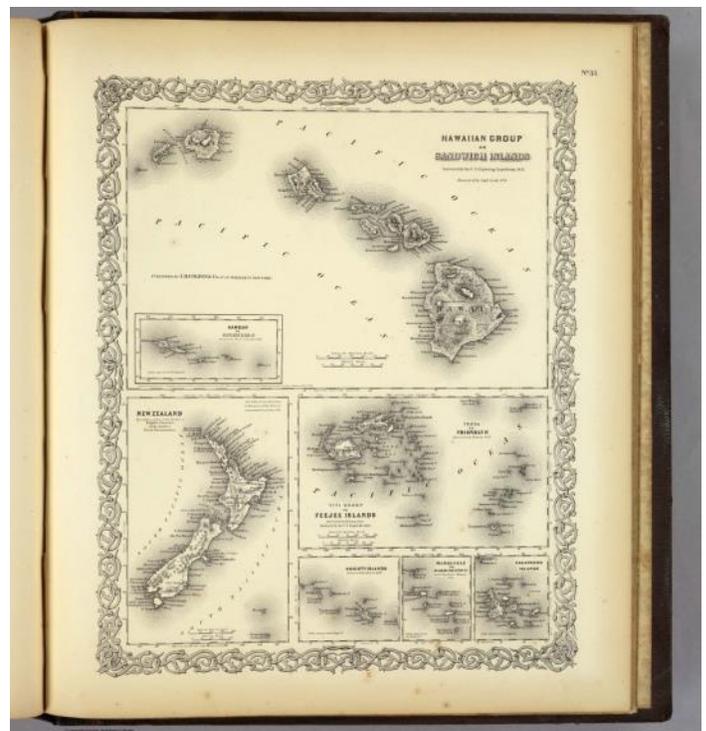
The spelling primer was sixteen pages long and Loomis printed 500 copies. The *Ali'i* were highly interested in learning the written language, but they were skeptical of the idea of distributing the spelling primer to the *Maka'ainana*. This, of course, was in conflict with the ideas of the Christian missionaries on the islands. To them, it was vital that the common people had access to the lesson plans and could learn and adopt the written language. Despite the concerns of the *Ali'i*, the missionaries persisted and soon the *Ali'i* were convinced. Men, Women, young and old were allowed to learn and study the written Hawaiian language. The provisional alphabet was used for more than three years, but Loomis continued to study the Hawaiian language in order to make a permanent one. It was on February 14, 1826 that the Hawaiian alphabet was permanently established; the letters A-E-I-O-U-H-K-L-M-N-P-W-’.

The development of the Hawaiian alphabet was an interactive process. Loomis, along with other translators, were required to listen and learn from the Hawaiian people in order to transcribe the verbal language into a written one. The case of King

Liholiho is especially striking. It is a perfect example of the blurred lines between collaboration and manipulation.

Using input from Liholiho, Loomis was able to create his written name. But through this creation, part of the oral language would be lost.

The confusion between the sound of an “l” and the sound of an “r” cannot be represented in a written language that differentiates between the two. It is the action of bending a language to fit into English dialects that was ultimately changing the Hawaiian language into a new one. From that day forward, King Liholiho's name (at least when read on paper) would be pronounced with a distinct “l” sound, the “r” sound would be gone forever. Shortly after, a U.S. exploring expedition would re-chart the Hawaiian Islands with the new adopted alphabet. The map, *Hawaiian Group or Sandwich Islands ... New Zealand ... Galapagos Islands* (Figure 4). by G.W. Colton is an early U.S. Governmental report following the creation of the new written language. As a U.S. governmental document, the map turned the written language into something that was official. There was no going back now, and any nuances between the 'olelo and written language would be gone.



**Fig. 4** G.W. Colton *Hawaiian Group or Sandwich Islands ... New Zealand ... Galapagos Islands*. 1856. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.

land ... Galapagos Islands (Figure 4). by G.W. Colton is an early U.S. Governmental report following the creation of the new written language. As a U.S. governmental document, the map turned the written language into something that was official. There was no going back now, and any nuances between the 'olelo and written language would be gone.

This process of transcription, of taking a verbal language and manipulating it to fit into words on a page mirrors that ideas of colonialism as a whole. It uses the traditions of native people but changes it into something that is newer and newer until the old is forgotten, or at least blanketed to the naked eye. Missionaries used the oral language, and based on phonetics, changed it into a written one. The core of the language was kept, but the written language was something entirely new. Maps provided a, often times governmentally official, platform for missionaries to make their permanent adjustments to the Hawaiian language.

The implications of an official written language were dire. One of the most glaring of which was the development of a western education system in the Islands. With a Hawaiian dictionary intact and distributed across the island nation, missionaries were able to develop an education curriculum the revolved around Christianity as well as western values. By the year 1853, 75% of Hawaiians over the age of sixteen were literate in the Hawaiian language. The literacy rate amongst Hawaiians was deemed remarkable, especially in comparison to the relatively low literacy rates in the United States at the time. The written Hawaiian language, paired with the use of maps, was a critical tool in the education and orientation of Hawaiian children in American colonial values.

### Western Education System

Maps not only tell stories but are often the precursors to stories that are yet unfold. In the case of Hawai'i, the western gaze and desire to map, name, and claim were clear years before the illegal overthrow of the Hawaiian monarchy, let alone Hawai'i becoming a territory or even a State. Produced in 1891, the *Map of California and Nevada 55* by D. Appleton and Co. (Figure 5), includes Hawai'i in a mapping of California. At the time of publication, Hawai'i was still a sovereign nation, yet it is color coded in the same scheme as the cities of Los Angeles, San Luis Obispo, and Fresno. Sumathi Ramaswamy dives into this subject in her book, *Terrestrial Lessons*. Ramaswamy explains geographical education of Indian children by the British as a means to produce colonized enlightened natives. The natives were to think of themselves not as inhabitants of earth, but as pieces in a vast British empire, color coded across the entire globe. *Map of California, Nevada 55* shows that Hawai'i was to be included into the United States before any physical action was even put into place. It was a way in which to teach Hawaiians to be a part of something bigger than themselves.

With an official Hawaiian alphabet, came new maps with naming and spelling of Hawaiian Islands and regions. The map, *Na Moku-puni o Hawaii Nei* (Figure 6, next page), which translates to "The Islands of Hawai'i," was the first map of the



*Fig. 5 D. Appleton & Co., Map of California and Nevada 55 (with inserts), 1891. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.*

Hawaiian Islands that was actually published in Hawai'i. Written and engraved by Simon Peter Kalama in 1837, a student at Lahainaluna Missionary School on the island of Mau'i, *Na Moku-puni o Hawaii Nei* offered some of the most detailed mapping of the Hawaiian Islands of the time. The map is written exclusively in Hawaiian and contains depictions of *ahupua'a*'s on each island. It is at turning point in Hawaiian history, marking a transition of land tenure systems. This map is crucial in understanding the intricacies of colonization in Hawai'i.

It is important to note that Kalama was a student at a missionary school, thus putting him at center of the topics touched on throughout this paper. He is a Hawaiian, educated in the writ-



**Fig. 6** Simon Peter Kalama. *Na Mokupuni o Hawaii Nei*. 1837. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.

ten Hawaiian language, creating maps depicting location and space in Hawai'i. Maps, similar to how the missionaries transcribed the Hawaiian language, turned land into a two-dimensional object on a piece of paper. By transcribing the Hawaiian 'olelo as well as the natural environment onto a piece of paper, maps such as *Na Mokupuni o Hawaii Nei* made way for Hawaiians to begin to understand the islands as a system in which they were both separated from as well as inherently a part of.

In some ways, Kalama fits perfectly into the missionary agenda. *Na Mokupuni o Hawaii Nei* is a map created by a Hawaiian, for other Hawaiians, contextualizing their position in western ideologies of land ownership and commodification. In other ways, the work of Kalama is a form of resistance to Christian missionaries. *Na Mokupuni o Hawaii Nei* is a memory of the traditional Hawaiian landscape, depicting the islands void of foreign contact. Using Hawaiian landmarks and valleys to depict the *ahupua'a* system, Kalama portrays indigenous knowledge in the face of the western science of cartography. As one of the most geographically accurate and detailed maps of the time, *Na Mokupuni o Hawaii Nei* is a good example of the interconnectedness of local knowledge and western science that is often overlooked and dismissed. As time moved forward, the missionary education system would continue to progress, and Hawaiian culture would be pushed further and further towards the margins. The days of communal land tenure were numbered and the Great *Mabele*, the Great Division of land was on the horizon.

### Transition of Land Tenure Systems

In July of 1824, King Liholiho died of measles on a trip to London. Following his death, it was his brother Kauikeaouli

(1814 – 1854) who was named the new *Mo'i* of the Hawaiian nation. Kauikeaouli was 11 eleven years old at the time. As a very young king, Kauikeaouli was prone to foreign influence. Between 1824 and 1844, over fifty war ships came to Hawai'i, and many threatened to take over Hawai'i. The imperial pressures from the American military made Kauikeaouli anxious about a permanent foreign takeover. With the voices of missionary governmental council members in his ear, Kauikeaouli ultimately decided to westernize the Hawaiian government for good, thus creating a formal legislature of the Hawaiian kingdom. Having heard the news, a large influx of missionaries left their missions to join the new Hawaiian government. The Hawaiian people were continuing to die rapidly from disease, missionaries had a stronghold on the education system, and had now infiltrated the native government. It was in this time of turmoil that King Kauikeaouli put in place the Great *Mabele* of 1848.

The Great *Mabele* was the regulation put in place that allowed private land ownership in Hawai'i. Kauikeaouli divided the land amongst three groups, the land for the *Mo'i*, the land for the *Ali'i*, and the land for the *Maka'ainana*. Kauikeaouli designated about one million acres of land for himself, to be passed down to future *Mo'i*. He divided around 1.6 million acres amongst 256 *Ali'i* and allotted about 28,600 acres for the rest of the Hawaiian people. The purpose of the *Mabele* was to ensure that the Hawaiian people would retain land ownership in the face of the rapid colonization of the islands. However, in many ways, the *Mabele* did the opposite. Foreigners were now legally able to purchase land off of the Hawaiian people, changing the concept of land ownership in Hawai'i forever.

With the sudden shift in land tenure systems, came a change in both surveying as well as cartography in Hawai'i. Although surveying is essential for private land ownership, the cartographical documents from the *Mabele* era show little consideration for such by those advocating for this new system. Few foreigners had a proper understanding of the components that contribute to the Western notion of private land ownership. Over the span of 13 years, titles were conveyed for about 13,000 pieces of land, ranging from the size of an *ahupua'a* of over 100,000 acres to parcels of land of less an acre. In some cases, even taro patches the size of one-tenth of an acre.

In this last portion of the essay, I will focus on the analysis of post-*Mabele* maps to track the cartographical transition of land tenure change in the Hawaiian Islands and to also look into these maps not just as stories of change, but as tools of converting traditional visions of the environment. The surveying work of the *Mabele* involved the interpretation of pre-existing land use patterns and describing them in an alien sym-

bology. Surveying the *Mabele* was a means by which to take from the old in order to manipulate the land into something new.

The specific map that I will be analyzing was created by C.J. Lyons and titled: *O'ahu, Hawaiian Islands*. Lyons is one of the most prominent figures in the post-*Mabele* cartography of the Hawaiian Islands. In 1850, at the age of seventeen and as a student at Punahou High School on O'ahu, Lyons was recruited by the Hawai'i Land Commission to survey properties following the *Mabele*. Lyons, being the son of missionaries, was granted immense power and responsibility at a strikingly young age. Through both trial and error Lyons developed cartographical skills, his work, despite his age, shaping the history of land ownership in Hawai'i as we know it.

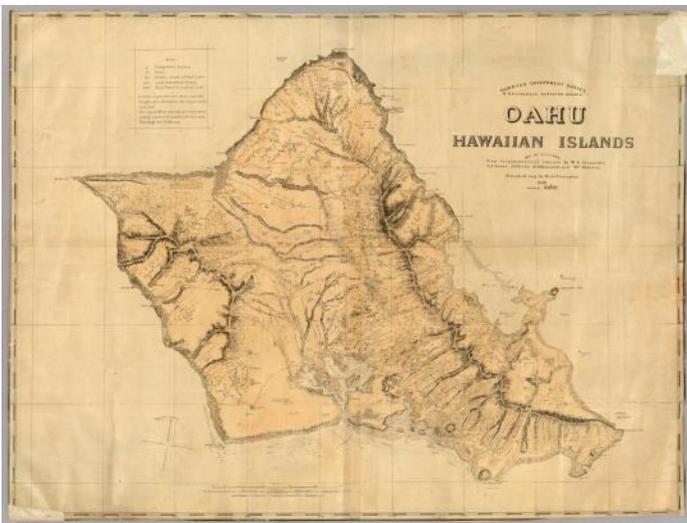
*O'ahu, Hawaiian Islands* (Figure 7) was created by Lyons thirty-one years following his first survey in 1850. The piece is incredibly detailed and offers one of the most intricate silhouettes of the O'ahu coastline of the time. Mountains, valleys, and rivers are clearly plotted and illustrated on the map, creating a detailed report of the island's topography. Not only is Lyons' map environmentally detailed, it also presents an intricate overlap of old native land tenure with that of plots of private property. *Ahupua'a*'s are not only correctly named and marked, but also labeled with the western ideologies of ownership. For example, on the western shore of the island, the *Keaau ahupua'a* is labeled, "crown" (belonging to the *Ali'i*) while the adjacent *Makua ahupua'a* is labeled, "gov't" (belonging to the Government of Hawai'i). On the North Shore of O'ahu there is another example of the overlap of systems. The *Kawela ahupua'a* is simply labeled, "Crown to

Hopkins." This clear transfer of land is at the intersection of the Hawaiian *ahupua'a* system and the imposed *Mabele*. The map depicts the Hawaiian *Ali'i* selling off an entire *ahupua'a* to a single missionary.

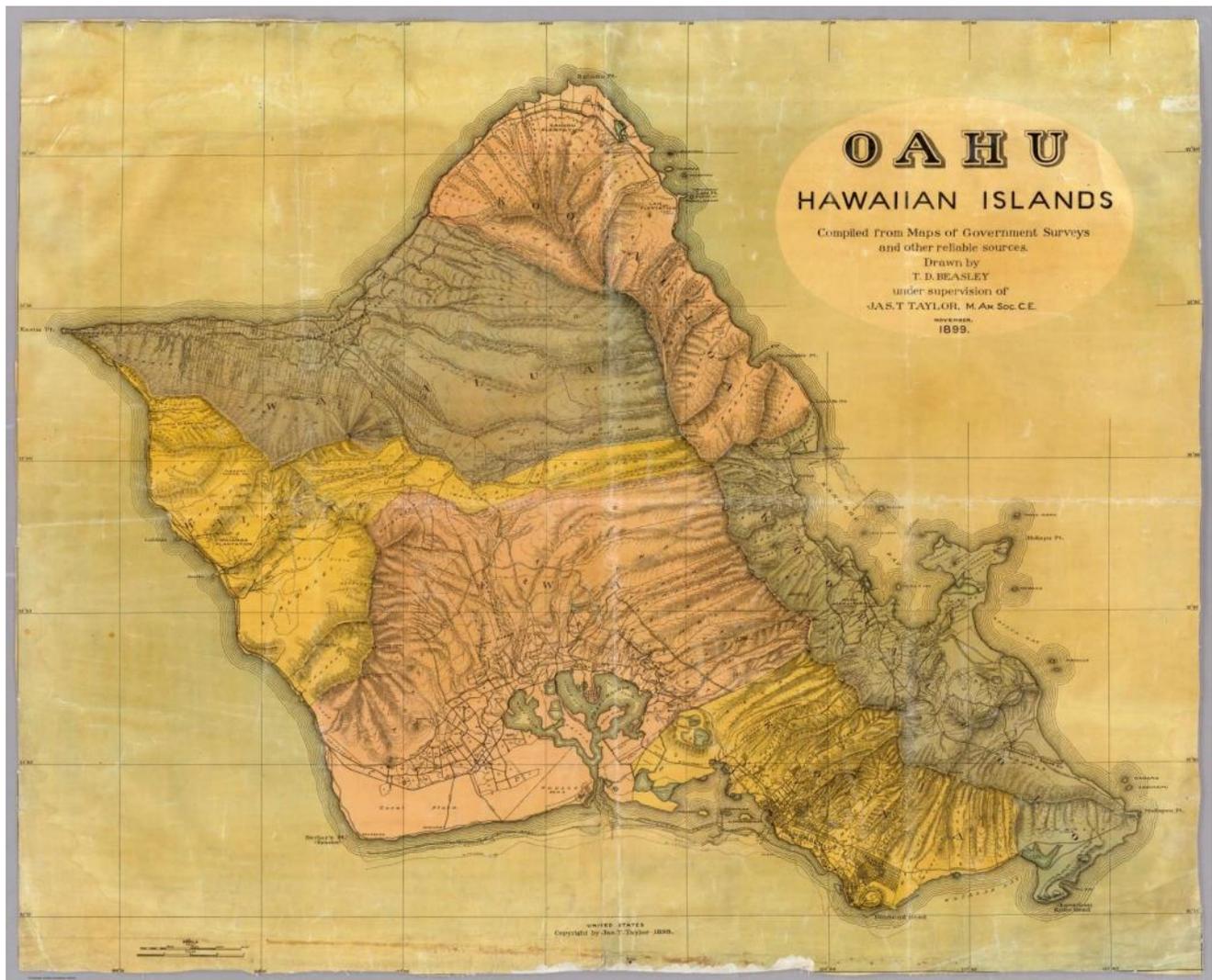
With exception to the *Kona* and *Ko'olaupoko* regions of the island, the divisions of land on O'ahu are relatively sparse and primarily located along the natural barriers of valleys and *ahupua'a*'s. Although taking place over 30 years after the *Mabele*, private property plots are relatively low in numbers. One reason for this is that much of the original purchasing of land was for agricultural purposes (primarily sugar cane) and took place on large plots. Another reason being that there were very few surveyors on the island and the process of surveying property was painstakingly slow. *O'ahu, Hawaiian Islands* is a pivotal map in demonstrating the process of missionary manipulation of the land. Through this map we are able to see the large transfers of land, disguised in large chunks of Hawaiian *ahupua'a*'s. The transition of land tenure change was clearly in full swing and the web of private property plots had begun to spread throughout the southern portion of the island.

Twenty-nine years following the creation of the first *O'ahu, Hawaiian Islands*, and immediately following the illegal annexation of the Hawaiian Islands by the American government came the production of a second, modified version (Figure 8, next page). This map shares the same name as the first but was created by T.D. Beasley. When comparing the two maps side by side there are two glaring differences. The first difference is that there is massive increase in property plots throughout the island. The *Kona* and *Ko'olaupoko* regions, which were just blossoming in development with the first *O'ahu, Hawaiian Islands* map are completely saturated with property lines on the second version. This second version shows a great increase in the division of land into small-scale properties, highlighting a clear immigration of foreigners seizing the opportunity to own land and homes in Hawai'i.

The second glaring difference is that, while the names of *ahupua'a*'s are in place, there is no recognition of crown lands or government lands. The name of each *ahupua'a* is used as a location of a valley in which to orient oneself rather than a representation of a once self-sustaining region of communal land division. The precursors set by the original map have manifested into something far more powerful and disruptive in the second. Reading like an urban map, grid-like properties resembling city streets, the second *O'ahu, Hawaiian Islands* blurs indigenous land use into something that better fits the western gaze of the recently illegally annexed Hawaiian Islands. The colonial practices used on these maps of O'ahu are simply a re-imagining of Hawai'i. Together they show the mindset of American colonizers as they worked to blanket the



**Fig. 7** W.D. Alexander, *Oaha Hawaiian Islands*, Hawaiian Government survey, 1881. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.



**Fig. 8** T.D. Beasley, *Oaha Hawaiian Islands*. Copywrite by J.T. Taylor, 1899. Image courtesy of the David Rumsey Map Collection at Stanford University Libraries.

traditional land tenure with increasingly modified land division systems. While the skeleton of the *ahupua`a* system is still present, the core has been dismantled into nothing more than the name of a valley.

### Conclusion

Colonial maps of Hawai`i acted as both markers of the colonization process as well as tools in which missionaries were able to obscure the lines between traditional and western land tenure systems. The transcription of the Hawaiian language led to the naming and commodification of the land. Missionaries were able to turn the *‘olelo* into a physical written object that was molded into something that best fit western ideologies. The written language also led to an American education system in the islands. Maps taught students to understand themselves not just as a part of Hawai`i, but as a part of the United States as a whole. This created a sense of otherhood as well as inclusion for Hawaiian students, which

helped streamline the colonization process.

With the Great *Mabele* came a new land tenure system. This system dismantled traditional Hawaiian beliefs of the sacredness of the land as well as the idea of communal land ownership in general. Missionaries used maps to not only show this transition on paper, but to also push aside and marginalize the Hawaiian culture that is so deeply rooted in the land. The images draw by James Cook and William Bligh in *Sandwich Islands* (Figure 1) mark the beginning of the western gaze on the islands of Hawai`i. From that moment forward, Europeans and American missionaries would continue to observe, learn from, mold, and ultimately change Hawai`i into an extension of their western vision in an attempt to erase Hawaiian culture from the cartographical lines of a map.

## Footnotes

- <sup>1</sup> Herman, R.D.K. *The Aloha State: Place Names and the Anti-conquest of Hawai'i*. Sustainable Development Information Network.
- <sup>2</sup> Pokhrel, Pallav, and Thaddeus A. Herzog. "Historical Trauma and Substance Use among Native Hawaiian College Students." *American Journal of Health Behavior* 38, no. 3 (2014): 420-29. doi:10.5993/ajhb.38.3.11.
- <sup>3</sup> The idea that the expansion of the United States was justified and inevitable.
- <sup>4</sup> Van Dyke, Jon. *Who Owns the Crown Lands of Hawai'i?* Hawai'i: University of Hawai'i Press. p 11. 2008.
- <sup>5</sup> The Skyfather, *Wakea*, and the Goddess *Ho'ohokukalani* were deeply in love and tried to have a baby. However, the child was a stillborn. They buried their child in the ground and their tears rained over the grave. Then, after a few days, the *Kalo* plant, the staple crop of the Hawaiian diet, emerged. Shortly after, *Wakea* and *Ho'ohokukalani* had another child. This one was named *Haloa* and was born healthy. *Haloa* is said to be the first Hawaiian human being.
- <sup>6</sup> Cho, John J., Roy A. Yamakawa, and James Hollyer. *Hawaiian Kalo, Past and Future*. Sustainable Agriculture. Honolulu, HI: Cooperative Extension Service, 2007.
- <sup>7</sup> Moffat, Riley M., and Gary L. Fitzpatrick. *Surveying the Mabele*. Vol. 2. Palapala`aina. Honolulu, HI: Editions Limited, 1995.
- <sup>8</sup> An *abupua'a* was a diverse agricultural system which was tended to by, used to sustain, those who lived within it. Each *abupua'a* was regulated by a *Konohiki*, while greater regions were regulated by *Ali'i*. *Maka'ainana* were allowed to work the land and grow food for one another but were also required to give portions of their food and resources to the *Konohiki* and even more to the *Ali'i*. However, this was not seen as a burden due to the large yields from the agricultural systems set in place. *Maka'ainana* were free to move from *abupua'a* to *abupua'a*. They were in no way bound to specific land. If one wanted to go elsewhere on the island, all they had to do was start supplying food to the *Konohiki* and *Ali'i* of that given *abupua'a*. (Van Dyke, *Who Owns the Crown Lands of Hawai'i?*, 13)
- <sup>9</sup> Sahlins, Marshall. et al 1995. *How "Natives" Think: About Captain Cook, For Example* Chicago & London: University of Chicago Press
- <sup>10</sup> The British brought venereal diseases such as gonorrhea and syphilis. (Pirie, Peter. *The Consequences of Cook's Hawaiian Contacts on the Local Population*. HI: University of Hawai'i at Manoa.) Other notoriously bad diseases brought to Hawai'i included tuberculosis, leprosy, smallpox, mumps, and scabies. Even diseases such as the common cold, or the flu were proven to be deadly amongst massive groups of Hawaiian people. In 1804, the first major epidemic disaster hit Hawai'i. An intestinal sickness, hypothesized to be typhoid fever, killed off about half of the Hawaiian population, totaling in at about 150,000 mortalities. (Van Dyke, *Who Owns the Crown Lands of Hawai'i?*, 26-27.)
- <sup>11</sup> Lucas, Paul F. Nahoa. *E Ola Mau Kakou I Ka 'Olelo Makuahine: Hawaiian Language Policy and the Courts*. Vol. 34. The Hawaiian Journal of History. 2000. p 1
- <sup>12</sup> Spaulding, Thomas M. "The First Printing in Hawaii." *The Papers*

*of the Bibliographical Society of America* 50, no. 4 (1956), p 319.

<sup>13</sup> Spaulding, *The First Printing in Hawaii*, 324.

<sup>14</sup> Lucas, *E Ola Mau Kakou I Ka 'Olelo Makuahine: Hawaiian Language Policy and the Courts*, 2.

<sup>15</sup> Judd, Bernice, Janet E. Bell, and Clare G. Murdoch. *Hawaiian Language Imprints, 1822-1899*. Honolulu, HI: Hawaiian Mission Children's Society and The University Press of Hawaii, 1978.

<sup>16</sup> Spaulding, *The First Printing in Hawaii*, 320.

<sup>17</sup> Spaulding, *The First Printing in Hawaii*, 322.

<sup>18</sup> Spaulding, *The First Printing in Hawaii*, 322.

<sup>19</sup> Warschauer, Mark, Keola Donaghy, and Hale Kuamo'yo. "Leoki: A Powerful Voice of Hawaiian Language Revitalization." *Computer Assisted Language Learning* 10, no. 4 (1997): 349-61. doi:10.1080/0958822970100405.

<sup>20</sup> Lucas, *E Ola Mau Kakou I Ka 'Olelo Makuahine: Hawaiian Language Policy and the Courts*, 2.

<sup>21</sup> Lucas, *E Ola Mau Kakou I Ka 'Olelo Makuahine: Hawaiian Language Policy and the Courts*, 2.

<sup>22</sup> Ramaswamy, Sumathi. *Terrestrial Lessons the Conquest of the World as Globe*. Hyderabad: Orient BlackSwan, 2018.

<sup>23</sup> Fitzpatrick, *Early Mapping of Hawaii*, p 107-112; McCorkle, *America Emergent* 72; P778, 3259, 4087.

<sup>24</sup> Watson-Verran, Hellen, and David Turnbull. *Science and Other Indigenous Knowledge Systems*. Sage Publications.

<sup>25</sup> Kauikeaouli embraced the western ideologies and thought of them as decent ways to organize society. He even welcomed many into his council of chiefs. (Trask, Mililani B. *Historical and Contemporary Hawaiian Self-Determination: A Native Hawaiian Perspective*. Arizona Journal of Comparative Law vol.8 no.2. p 77. 1991.)

<sup>26</sup> Trask, *Historical and Contemporary Hawaiian Self-Determination: A Native Hawaiian Perspective*, 78.

<sup>27</sup> Trask, *Historical and Contemporary Hawaiian Self-Determination: A Native Hawaiian Perspective*, 78.

<sup>28</sup> King, Samuel P., and Randall W. Roth. *Broken Trust: Greed, Mismanagement & Political Manipulation at America's Largest Charitable Trust*. Honolulu, HI: University of Hawai'i Press.

<sup>29</sup> Linnekin, Jocelyn. *The Hui Lands of Keanae: Hawaiian Land Tenure and the Great Mabele*. 1983

<sup>30</sup> Trask, *Historical and Contemporary Hawaiian Self-Determination: A Native Hawaiian Perspective*, 79.

<sup>31</sup> Moffat, Riley M., and Gary L. Fitzpatrick. *Surveying the Mabele*. Vol. 2. Palapala`aina. Honolulu, HI: Editions Limited, 1995, p 52.

<sup>32</sup> Moffat, Riley M., and Gary L. Fitzpatrick. *Surveying the Mabele*, 56.

<sup>33</sup> Moffat, Fitzpatrick, *Surveying the Mabele*, 58.

<sup>34</sup> Van Dyke, *Who Owns the Crown Lands of Hawai'i?* Hawai'i: University of Hawai'i Press, 33.

<sup>35</sup> Moffat, Fitzpatrick, *Surveying the Mabele*, 62.

## Bibliography

- Cho, John J., Roy A. Yamakawa, and James Hollyer. *Hawaiian Kalo, Past and Future*. Sustainable Agriculture. Honolulu, HI: Cooperative Extension Service, 2007.
- Fitzpatrick, *Early Mapping of Hawaii*, p 107-112; McCorkle,

- America Emergent 72; P778, 3259, 4087.
- Herman, R.D.K. *The Aloha State: Place Names and the Anti-conquest of Hawai'i*. Sustainable Development Information Network.
- Judd, Bernice, Janet E. Bell, and Clare G. Murdoch. *Hawaiian Language Imprints, 1822-1899*. Honolulu, HI: Hawaiian Mission Children's Society and The University Press of Hawaii, 1978.
- King, Samuel P., and Randall W. Roth. *Broken Trust: Greed, Mismanagement & Political Manipulation at America's Largest Charitable Trust*. Honolulu, HI: University of Hawai'i Press.
- Linnekin, Jocelyn, *The Hui Lands of Keanae: Hawaiian Land Tenure and the Great Mabele*. 1983.
- Lucas, Paul F. Naho. *E Ola Mau Kakou I Ka 'Olelo Makua-hine: Hawaiian Language Policy and the Courts*. Vol. 34. The Hawaiian Journal of History. 2000.
- Moffat, Riley M., and Gary L. Fitzpatrick. *Surveying the Mabele*. Vol. 2. Palapala`aina. Honolulu, HI: Editions Limited, 1995.
- N.L. Evenhuis & J.M. Fitzsimons. *Biology of Hawaiian Streams and Estuaries*. Bishop Museum Bulletin in Cultural and Environmental Studies 3, (2007).
- Pirie, Peter. *The Consequences of Cook's Hawaiian Contacts on the Local Population*. HI: University of Hawai'i at Manoa.
- Pokhrel, Pallav, and Thaddeus A. Herzog. "Historical Trauma and Substance Use among Native Hawaiian College Students." *American Journal of Health Behavior* 38, no. 3 (2014): 420-29. doi:10.5993/ajhb.38.3.11.
- Ramaswamy, Sumathi. *Terrestrial Lessons the Conquest of the World as Globe*. Hyderabad: Orient BlackSwan, 2018.
- Spaulding, Thomas M. "The First Printing in Hawaii." *The Papers of the Bibliographical Society of America* 50, no. 4 (1956).
- Trask, Mililani B. *Historical and Contemporary Hawaiian Self-Determination: A Native Hawaiian Perspective*. Arizona Journal of Comparative Law vol.8 no.2. 1991.
- Van Dyke, Jon. *Who Owns the Crown Lands of Hawai'i?* Hawai'i: University of Hawai'i Press. 2008.
- Warschauer, Mark, Keola Donaghy, and Hale Kuamojo. "Leoki: A Powerful Voice Of Hawaiian Language Revitalization." *Computer Assisted Language Learning* 10, no. 4 (1997): 349-61. doi:10.1080/0958822970100405.
- Watson-Verran, Hellen, and David Turnbull. *Science and Other Indigenous Knowledge Systems*. Sage Publications.

### Maps

- Appleton, D. & Co. "Map of California, Nevada. 55." In *David Rumsey Historical Map Collection*. New York: D. Appleton &, 1891.

- Beasley, T.D. "Oahu, Hawaiian Islands." In *David Rumsey Historical Map Collection*. San Francisco, CA: J.T. Taylor, 1899.
- Colton, G.W. "Hawaiian Group Or Sandwich Islands ... New Zealand ... Galapagos Islands." Map. In *David Rumsey Historical Map Collection*. New York: J.H. Colton, 1856.
- Cook, James, and William Bligh. "Sandwich Islands." In *David Rumsey Historical Map Collection*. London: G. Nicol and T. Cadell, 1785.
- Cook, James, and William Bligh. "Chart of the Sandwich Islands. (with) Sketch of Karakakooa Bay." In *David Rumsey Historical Map Collection*. London: G. Nicol and T. Cadell, 1785.
- Kalama, Simon P. "Na Mokupuni O Hawaii Nei." Map. In *David Rumsey Historical Map Collection*. Lahainaluna: Mission Press, 1837.
- Lyons, C.J. "Oahu, Hawaiian Islands." Map. In *David Rumsey Historical Map Collection*. HI: Hawaiian Government Survey, 1881.
- Vancouver, George. "Charts of the Sandwich Islands." In *David Rumsey Historical Map Collection*. London: G.G. & J. Robinson, 1798.

Behold an antique map and grasp art, science and knowledge in your hands.

**ORIGINAL ANTIQUE MAPS**  
by Carol J. Spack

Offering geographic and thematic maps, celestial charts, nautical charts, railroad maps, travel guides and urban bird's eye views. Occasionally you may find broadsides with rich compositions of type fonts, imagery and text, illustrated 19th century children's books or 19th century scientific materials and from the 20th century boldly colorful pictorial maps of places both real and imagined.

Original Antique Maps  
P.O. Box 3003  
Framingham, MA 01705  
(508) 820-9100  
www.spackantiquemaps.com  
carol@spackantiquemaps.com



# WASHINGTON MAP SOCIETY

## THE PORTOLAN

Journal published 3 times per year with original articles, meeting summaries, book reviews, and lots more. Sent worldwide. Published in digital & print versions. All past issues available on the WMS website.

## LOCAL & REGIONAL MEETINGS AND FIELD TRIPS

Periodically during the year. Videos of the meetings are posted on the WMS website.

## THE RISTOW PRIZE

Annual scholarly writing award for Cartographic History.

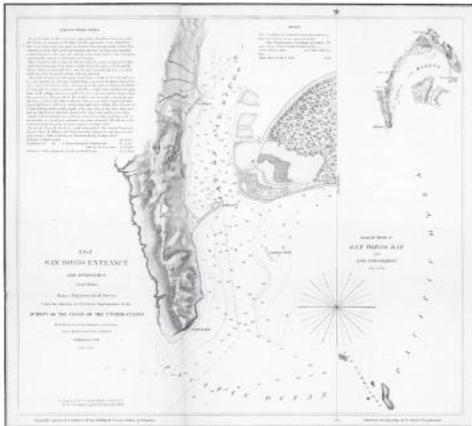
**For Membership, Inquiries & More Information  
Visit the Washington Map Society website  
and Join us on Facebook too ....**

**[www.WashMapSociety.org](http://www.WashMapSociety.org)**

# MAP & ATLAS MUSEUM

SEVEN CENTURIES  
OF CARTOGRAPHY  
ON DISPLAY

OF LA JOLLA



7825 FAY AVE.  
COURTYARD LEVEL  
LA JOLLA, CA 92037

CALL TOLL FREE  
FOR INFORMATION  
1.855.OLD.MAPS

[WWW.LAJOLLAMAPMUSEUM.ORG](http://WWW.LAJOLLAMAPMUSEUM.ORG)

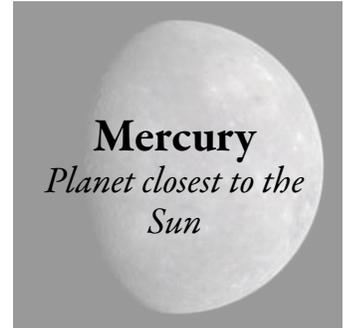
# CARTO-QUIZ

## Answers



**Phoebe**  
*Moon of Saturn*

*Science On a Sphere: NOAA*



**Mercury**  
*Planet closest to the Sun*

*Image: NASA MESSENGER probe*



**Mars**  
*4th planet from the Sun*

*"The Grand Canyon of Mars": NASA*



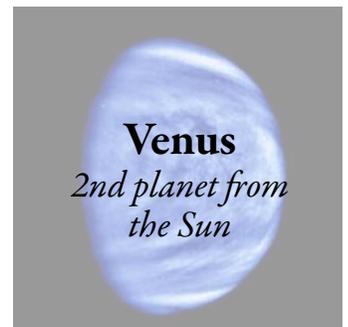
**Titan**  
*Moon of Saturn*

*Near infrared image: NASA/JPL*



**Europa**  
*Moon of Jupiter*

*Image from Galileo orbiter : NASA*



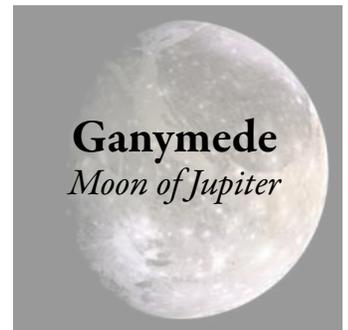
**Venus**  
*2nd planet from the Sun*

*Image from Galileo orbiter: NASA/JPL*



**Neptune**  
*8th planet from the Sun*

*Near infrared image: NASA/JPL*



**Ganymede**  
*Moon of Jupiter*

*Image from Galileo orbiter : NASA*

MAPPING HERE & THERE:  
MEETINGS AND EXHIBITS OF INTEREST TO MEMBERS

**February 29, 2020**, New York, NY. The New York Map Society will present Andres Kapochunas' discussion of "New York's Newtown Creek: Death and Resurrection – A Chronicle in Maps and Photographs" at The World School, 11 E. 26<sup>th</sup> Street, at 2 PM. Please RSVP to [mapsocietyNY@gmail.com](mailto:mapsocietyNY@gmail.com) February 29, New York, NY.

**March 1, 2020**, Los Angeles, CA. The LA Geographical Society will present Parveen Chhetri's lecture "Are Trees Moving Upslope? A Story from the Nepal Himalaya" at 4 PM at LA City College, Science and Technology Building, 855 North Vermont Avenue, at 4 PM.

**March 14-15, 2020**, Miami, FL. [Miami International Map Fair](#) will be held at [HistoryMiami](#), 101 West Flagler Street. There will be a private VIP Preview and Sale on March 13. For further details, contact Hilda Masip at [hmasip@historymiami.org](mailto:hmasip@historymiami.org), or call (305)375-1618.

**March 14, 2020**, Portland, ME. Dr. Tim Wallace will speak on "Mapmaking in the Age of Artificial Intelligence" at the Osher Map Library at Hannaford Hall, the University of Southern Maine at 6 PM.

**March 14, 2020**, New York, NY. The New York Map Society will present Eric Sanderson, who will be speaking on "The Manhattan Project" at The World School, 11 E. 26<sup>th</sup> Street, at 2 PM. Please RSVP to [mapsocietyyny@gmail.com](mailto:mapsocietyyny@gmail.com).

**March 19-20, 2020**, Chicago, IL. The Chicago Map Society will present George Ritzlin, who will explain *How to Buy a Map: Everything Else You Need to Know*. George Ritzlin, a founding member of the Chicago Map Society, will return with the second half of his two-part presentation on map collecting. In his first presentation, George explained how to determine the authenticity of an antique map and explored the process of paper production, printing, coloring and atlas assembly. In part two, George will help members build on their map-collecting expertise by providing insights on focusing collecting interests, sharing details on how the map market works (and where to buy maps), and best practices for storage, organization and cataloging a collection. The meeting will be held in Ruggles Hall, at the Newberry Library, 60 W. Walton Street, at 5:30 PM.

**March 19, 2020**, London. The Twenty-Ninth Series of "[Maps and Society](#)" lectures in the history of cartography are convened and meetings will be held at the Warburg Institute, School of Advanced Study, University of London, Woburn

Square, London WC1H OAB, at 5.00 pm. Admission is free and each meeting is followed by refreshments. All are most welcome. Dr Ronald Grim (formerly Curator of Maps, Norman B. Leventhal Map and Education Center, Boston Public Library, USA) will discuss *Annotated Atlases: Unravelling Stories of Personal Provenance*. For information, contact Tony Campbell [tony@tonycampbell.info](mailto:tony@tonycampbell.info) or +44 (0)20 8346 5112 (Catherine Delano-Smith).

**March 26-29, 2020**, Strasbourg, France. The 15th Atlastage [Atlas Days], *Mapping Europe in the Nineteenth Century*, will be held in partnership with the Protestant Academy, Haus Villigst, Schwerte. It is the first time that the event has taken place outside Germany. There are opportunities to display, share and trade. The French location is an opportunity to explore the influence of French cartography on the mapping of nineteenth century Germany. Additional information from Jurgen Spanhorst: [pan@schwerte.de](mailto:pan@schwerte.de) or Francis Fischer [francis.fischer90@sfr.fr](mailto:francis.fischer90@sfr.fr).

**March 26, 2020**, Washington, DC. The Washington Map Society will meet at a time and place to be announced; date to be confirmed. Cassandra Farrell, Senior Map Archivist at the Library of Virginia, will discuss *Vacationing in Virginia, 19th Century Style: Plan of Fauquier White Sulphur Springs with Proposed Building Lots*.

**April 3-4, 2020**, Naples, Italy. The fourth edition of the [Naples Map, Atlas & Travel Book Fair](#) will take place at Grand Hotel Oriente, Via Armando Diaz, 44.

**April 5, 2020**, Los Angeles, CA. The LA Geographical Society presents Addie Farrell's discussion of "Environmental Planning: A Nexus of Geography Curriculum, Internships, Jobs, and Careers" at LA City College Science and Technology Building, 855 North Vermont Avenue, at 4 PM.

**April 6-10, 2020**, Denver, CO. The American Association of Geographers' Annual meeting will explore the latest in research and applications in geography, sustainability, and GIScience. This will be an interdisciplinary forum, and all scholars, researchers, and students are welcome. The five-day conference will host more than 7,000 geographers from around the world and features over 5,000 presentations, posters, workshops, and field trips by leading scholars, experts, and researchers. Sessions will be organized around many subfields, special tracks, and featured themes.

**April 14-18, 2020**, Granby, CO. The International Cartographic Association is holding its *12th Mountain Cartography Workshop*, bringing together cartographers, geographers, and others in a relaxed and beautiful setting to share new develop-

ments in cartography, design, and spatial analysis related to mountain environments. The theme of the workshop is People, Maps, and Mountains. Typically, about 50 people from multiple nations attend and it is a great opportunity for students, faculty, and mapping professionals to present their research. The workshop will be held at Snow Mountain Ranch.

**April 16, 2020**, Chicago, IL. The Chicago Map Society will present Jasper van Putten's discussion "Networked Nation: Mapping German Cities in Sebastian Münster's *Cosmographia*". This will be a special joint presentation between the Chicago Map Society and The Center for Renaissance Studies at the Newberry. The Newberry Library owns a copy of the 1550 edition of Sebastian Münster's *Cosmographia*, published in Basel from 1544 to 1628 by Münster's stepson Heinrich Petri and his sons. The 1550 printing is the first to include an important series of large woodcut city views contributed by city governments and scholars throughout the German Holy Roman Empire. Prof. van Putten argues that Münster's network of makers and contributors of city views—from German princes and artists to Swiss woodcutters, draftsmen, and printers—expressed their local and national cultural identities in their city views. Hence, the *Cosmographia*, and the city books it inspired, offer insights into the development of German and Swiss identity from 1550 to Switzerland's independence from the empire in 1648. The meeting will be in Ruggles Hall, The Newberry Library, 60 W Walton St, at 5:30 PM

**April 18, 2020**, New York, NY. The New York Map Society presents Lars Grava, who will be speaking on "At the Edge of Empire: Mapping the Baltic States" at The World School, 11 E. 26<sup>th</sup> Street, at 2 PM. Please RSVP to [mapsociety@nyu.edu](mailto:mapsociety@nyu.edu).

**April 21-24, 2020**, Barcelona, Spain. The *8th Iberoamerican Symposium of History of Cartography* will be held at Institut Cartogràfic i Geològic de Catalunya. The topic will be *The Map as a Cultural Connection between America and Europe*. Additional information from [siahc@icgc.cat](mailto:siahc@icgc.cat).

**April 21-23, 2020**, Istanbul, Turkey. The ICA Commission on the History of Cartography and the German Archaeological Institute (DAI) – Department Istanbul will jointly host the 8th International Symposium on the History of Cartography: *Mapping the Ottoman Realm: Travelers, Cartographers and Archaeologists*. The venue will be the Library of the DAI, located in the heart of Istanbul, next to Taksim Square. The symposium is open to everyone with an interest in the cartography of the (former) Ottoman countries during, but not limited to, the 16th to 20th centuries and will focus on two main themes: "Cartography of the Ottoman Countries in Europe, Asia and Africa" and "Mapping Archaeological Sites, Land-

scapes and Excavations in the Ottoman Empire in the 19th and 20th Centuries." Registration will open in the autumn of 2019. The organizers invite the submission of abstracts for long (25 min) and short (10 min) oral presentations. These need to reach the organizers by the 1st of November 2019. Questions regarding the symposium can be directed to: Imre Demhardt – ICA Commission on the History of Cartography: [demhardt@uta.edu](mailto:demhardt@uta.edu) or Andreas Schachner – German Archaeological Institute (DAI), Department Istanbul: [andreas.schachner@dainst.de](mailto:andreas.schachner@dainst.de).

**April 25, 2020** - Chadds Ford, PA. The Philadelphia Map Society will examine the maps on display in the Votes for Women Exhibition. Dr. Amanda Burdan, the exhibit's curator will share her insights on the extensive use of maps in the suffrage campaign and the group will have a private tour of the exhibition. The meeting will be held at the Brandywine River Museum, 1 Hoffman's Mill Rd. at 11 AM. There is a \$16 charge for admission and the private tour. For additional information, contact Barbara Drebing Kauffman at [philamapsociety@gmail.com](mailto:philamapsociety@gmail.com).

**April 25, 2020**, Richmond, VA. Dr. Larry Tise and Andrew Lawler will speak at the Library of Virginia's Voorhees Lecture on the History of Cartography. Dr. Tise's presentation, based on his recently published book, will be *The First American Coloring books: Theodore de Bry's Grand Voyages, 1590-1602* focused on Theodore de Bry's engravings, and his series of exploration narratives lavishly illustrated with his own copper plate engravings beginning with Thomas Harriot's book on the Indians and lands of Virginia. De Bry's iconic engravings instantly became the classic images of how we still conceive native Americans. His folio-sized books also became our first American coloring books - inviting Europe's artists to use their imaginations in applying colors.

Andrew Lawler will present *Uncharted Territory: How Maps Launched --And Nearly Sank--English Colonization of the New World*. In the late sixteenth century, England lagged far behind other European powers such as Spain and Portugal in known what was where in the New World. The scramble to fill this gap played a central role in how, where, and why the English launched their first attempt to settle the New World. Box lunches are offered for advanced purchase only. The meeting will be held at the Library of Virginia, 800 E. Broad St., from 10 AM to 4 PM. Registration is required. Contact Dawn Gregg at [dawn.gregs@lva.virginia.gov](mailto:dawn.gregs@lva.virginia.gov), or call (804)692-3813.

**April 30, 2020**, London, U.K. The Twenty-Ninth Series of "Maps and Society" lectures in the history of cartography features Dr Jacob Gestman Geradts presentation of "Cornelis de Hooghe (1541–1583): Emperor's Son and Cartographer."

Meetings are free, are followed by refreshments, and are held at the Warburg Institute, School of Advanced Study, University of London, Woburn Square, London WC1H 0AB, at 5.00 pm. For information, contact Tony Campbell at [tony@tonycampbell.info](mailto:tony@tonycampbell.info) or call +44 (0)20 8346 5112 to reach Catherine Delano-Smith.

**May 3, 2020**, Los Angeles The LA Geographical Society will sponsor a Student Research Symposium, with presentations, posters, and maps, by students at colleges and universities in Southern California, at 4 PM.

**May 3-5, 2020**, Big Bear, CA. The Spring Meeting of the California Geographical Society will be held at The Lodge at Big Bear Lake. There is a call for papers deadline of April 1<sup>st</sup>. The meeting will also host a student paper and poster competition. For further information and details, check [www.calgeog.org/conferences](http://www.calgeog.org/conferences).

**May 5, 2020**, Cambridge, U.K. The Cambridge Seminars in the History of Cartography will feature Michael Bravo's lecture on "Polar maps and their histories: reflections on the changing fortunes of cosmography". All are welcome, refreshments will be available, and the meeting will be held in the Gardner Room at Emmanuel College, St Andrew's Street, at 5.30 pm. For information, contact Sarah Bendall [sarah.bendall@emma.cam.ac.uk](mailto:sarah.bendall@emma.cam.ac.uk), or call +44 01223 330476.

**May 6-7, 2020**, London, U.K. The George Bellas Greenough Map Bicentenary Meeting will celebrate the bicentennial of the Geological Map of England and Wales by George Bellas Greenough (1778-1855), who was also instrumental in the founding of University College London. The conference will feature viewings and discussions as well as a celebratory dinner. For registration and additional information contact Duncan Hawley at [duncan.hawley.hogg@gmail.com](mailto:duncan.hawley.hogg@gmail.com).

**May 7-10, 2020**, Kalamazoo, MI. The International Congress on Medieval Studies will have special 'Mappings' sessions on "Charting a Global Middle Ages, Challenging the Pre-Modern/Modern Dichotomy". For further information contact Felicitas Schmieder at [felicitas.schmieder@fernuni-hagen.de](mailto:felicitas.schmieder@fernuni-hagen.de) or Dan Terkla [terkla@iwu.edu](mailto:terkla@iwu.edu).

**May 12-14, 2020**, Leith, Scotland. The International Map Collectors' Society will visit Edinburgh's port town in a special, 3-day event. Reservations may be made on line at the IMCoS website.

**May 15, 2020**, Tysons Corner, VA. The Washington Map Society's annual dinner meeting will be held in Maggiano's

Little Italy Restaurant at Tysons II Galleria. Dr. Larry Tise, co-author of "Theodore de Bry—America: The Complete Plates from 1590-1602," will share his insights on the writing of the book and the many colorful images of early maps and native American populations depicted therein.

**May 21, 2020**, Chicago, IL. The Chicago Map Society meeting will feature CMS member Amanda Murphy, presenting "Carto-Caricatures of the Midwest", a region often difficult to define. She will explore possible definitions of the region in her presentation on carto-caricatures of the Midwest. This meeting will include an annual Business Meeting and will be held at Ruggles Hall, the Newberry Library, 60 W. Walton Street at 5:30.

**May 28, 2020**, Oxford, U.K. The 27th Annual Series Oxford Seminars In Cartography will present Katherine Parker (Barry Lawrence Ruderman Antique Maps Inc./Hakluyt Society)'s discussion of "Maps in Books, maps and books: cartography and narrative in British voyage literature 1748-2008." Refreshments in the Weston Café from 3:45, and lecture 4:30-6:00PM at the Weston Library Lecture Theater, Broad Street, Oxford OX1 3BG. For information, contact Nick Millea at [nick.millea@bodleyian.ox.ac.uk](mailto:nick.millea@bodleyian.ox.ac.uk), or call 01865 287119.

**May 29-30, 2020**, Houston, TX. The Texas Map Society's 2020 spring meeting will focus on "Exploring Space: Discovering Texas and Beyond". It will be held at the Fondren Library at Rice University, Houston. Contact James Harkins at [James.Harkins@glo.texas](mailto:James.Harkins@glo.texas) for further information.

**June 4-5, 2020**, Lisbon, Portugal. This international workshop dedicated to the History of Nautical Cartography, will focus "On the Origin and Evolution of the Nautical Chart" will take place at the Hydrographic Institute. For further information, contact Joaquim Alves Gaspar at [alvesgasparj@gmail.com](mailto:alvesgasparj@gmail.com).

**June 6-7, 2020**, London, UK. The *London Map Fair* will be held at Royal Geographical Society, 1 Kensington Gore.

**June 11-13, 2020**, São Paulo, Brazil The Trustees of the International Society for the History of the Map host the ISHMap biennial symposium. For information, contact Dr. Carla Lois, at [ishmap.secretary@gmail.com](mailto:ishmap.secretary@gmail.com).

**June 18, 2020**, Lake Forest, IL The Chicago Map Society making their annual field trip to the MacLean Collection, one of the premier map destinations in the United States, with close to 40,000 individual items. Resident expert, professor, and author Michael Conzen will assist in the exploration of atlases which provide a window of insight into a county's history, de-

mographics and development at 5:30 pm.

**July 6-9, 2020**, Leeds, U.K. The 7th International Medieval Congress at the University of Leeds will have 'Mappings' sessions on the theme of "Borders" (or any aspect of medieval mappings). Contact Felicitas Schmieder [felicitas.schmieder@fernuni-hagen.de](mailto:felicitas.schmieder@fernuni-hagen.de), or Dan Terkla at [terkla@iwu.edu](mailto:terkla@iwu.edu).

**September 6-9, 2020**, Sydney and Canberra, Australia. The International Map Collectors' Society's annual symposium will be at the State Library of New South Wales in honor of the 250th anniversary of James Cook's discovery of the east coast of Australia. It is probable that we will have a post conference trip to Canberra with a visit to the National Library of Australia, and its wonderful collection. For information, contact Maggie Patton at [maggie.patton@sl.nsw.gov.au](mailto:maggie.patton@sl.nsw.gov.au).

**September 9-12, 2020**, Basel, Switzerland. The [\*20. Kartographiehistorisches Colloquium\*](#) will be held at Kollegiengebäude der Universität.

**September 11-12, 2020**, Winston-Salem, NC. The Museum of Early Southern Decorative Arts will host a conference on "[Mapping and Migration](#)." From the earliest mapping of North America by European navigators to campaigns during the French & Indian War and the American Revolution, to further exploration through westward expansion, the conference's list of speakers will delve into how different communities used maps as tools to establish unique visions of the American South. Registration will open in early Spring 2020. And the conference will be held at the Museum, 924 S Main St,

**John Dockett**, a long time member of the Washington Map Society, maintains a website bursting with news of the cartographic world. Check out: [www.dockett.com](http://www.dockett.com)



## GERALD GREENBERG 1933 - 2019

Gerald Greenberg was born in Illinois on May 09, 1933. The family moved to the Los Angeles/Hollywood area when he was five years old. Jerry worked for a well-known German map company to be able to afford his studies at UCLA, where he graduated with a Masters in Cartography/Geography. He then moved to Seattle, Washington for his Ph.D. After completion of his doctorate, Jerry taught cartography at the California State University, Sacramento for five years. He subsequently received an attractive offer from the US Geological Survey in Menlo Park, CA, where he worked for two decades until his retirement.

Jerry and Karina met at Lake Tahoe in 1970 and got married in 1972. Karina noted that Jerry was not only very intelligent, he was also a wonderful, kind and caring husband.

His hobby since the 1940's was his love for HAM Radio, where he could talk to the whole world. He was a long-time member of the California Map Society. He shared his knowledge with our members at our regional conferences and produced a number of Occasional Papers for the Society.

The last 3 years Jerry suffered with severe Parkinson's disease and passed away Oct. 07, 2019. He died at home, which was his wish.

The members of the California Map Society regrets his passing. The editor and publisher appreciates the information about Jerry's life provided by Karina Limmert-Greenberg.

# CALIFORNIA MAP SOCIETY OFFICERS: 2019-20

President, Jon Jablonski  
[president@californiamapsociety.org](mailto:president@californiamapsociety.org)

VP for Northern California, Ronald Gibbs, MD  
[Ronald.Gibbs@ucdenver.edu](mailto:Ronald.Gibbs@ucdenver.edu)

Treasurer, John Fleming  
[treasurer@californiamapsociety.org](mailto:treasurer@californiamapsociety.org)

Secretary, Kenneth Habeeb  
[secretary@californiamapsociety.org](mailto:secretary@californiamapsociety.org)

VP for Membership, Fred DeJarlais  
[vp-mem@californiamapsociety.org](mailto:vp-mem@californiamapsociety.org)

VP for Publications, Juliet Rothman  
[rothman@berkeley.edu](mailto:rothman@berkeley.edu)

Immediate Past President, Susan Caughey  
[pastpres@californiamapsociety.org](mailto:pastpres@californiamapsociety.org)

## BECOME A MEMBER!

Student	\$15
Retired	\$30
Active	\$40
Patron	\$100
Life	\$500

Register online at:  
[www.californiamapsociety.org](http://www.californiamapsociety.org)

## PAST PRESIDENTS

Norman J.W. Thrower	1979-1980
Gerald Greenberg	1980-1985
Vincent Mazzucchelli	1986-1989
Cherie Northon	1990-1992
Alfred W. Newman	1993-1996
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
John Fleming	2015-2017
Susan Caughey	2017-2019

## NEW MEMBERS 2019-20

Robert Augustyn  
 Carlos Baez  
 Ashley Boots  
 Sandra Cook  
 Graham Creasey  
 Daniel Elrol  
 Rowena Forest  
 Maricruz Gomez  
 Mark Gordon  
 Geoffrey Oliver Lewis  
 Stace Maples  
 Junius McElveen, Jr.  
 Ron Miller  
 Nyle Monday  
 Dennis Morris  
 Andria Olson  
 Stephen Olson  
 Thomas Philipps  
 Emily Prince  
 Gilbert Reeser  
 Mike Schembri  
 Markham Shofner  
 Fran Siegel  
 Anne Simmons  
 Delaney Stock  
 Nicole Wang  
 April Webster  
 Hannah Wild  
 Drew Williams  
 Curtis Wright



*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.

California Map Society  
 Copyright 2019

## ADVERTISING IN CALAFIA

Pricing per Issue	No. of Issues	
	2	1
Full page, verso of cover	\$450/\$250	
Full page, back cover	\$450/\$250	
Full page	\$400/\$225	
Half page	\$300/\$175	
Quarter page	\$200/\$125	
<u>Size</u>		
Full page	10"H x 7.5" W	
Half page	4.75"H x 7.5" W	
Quarter page	4.75"H x 3.625" W	
<u>Format</u>		
JPG or PDF, 300-400 DPI		

Remissions, payable to California Map Society, should be mailed to John Fleming, CMS Treasurer, 2034 Springfield Ave, Hermosa Beach, CA 90254

Send ad copy to Fred DeJarlais, Publisher, 4800 Grace St, Capitola, CA 95010  
[fred.dejarlais@gmail.com](mailto:fred.dejarlais@gmail.com)  
 415-948-6579

THE LEADERS  
THE COLUMBUS BUGGY CO'S  
THE SPALDING  
THE REDENA  
**BIG GIGS**  
**COLUMBUS BUGGY CO**  
GENERAL AGENTS  
218-215 MARKET ST SAN FRANCISCO  
862-866 TWELFTH ST OAKLAND

THE BEST TOGO  
THE BLUE FRONT  
THE LEADER  
W.R. CYCLES  
SOLE AGENT  
1221 MARKET ST  
THE PARK CYCLERY  
RENTING AND REPAIRING...  
LARGE RIDING SCHOOL  
TERMINUS OF THE  
MILLISTER, POWELL  
AND GEARY ST.  
CAR LINES  
A. F. WORTHY,  
Manager

HELICAL TUBE PRIMERS  
Strongest & Lightest  
No other manufacturer  
can use the helical tube  
theory which makes the  
important parts of the  
braking mechanism  
1 1/2 times stronger  
than the ordinary  
type by weight.  
**PREMIER CYCLE CO**  
INCORPORATED  
San Francisco  
Depot, Salesroom & Factory  
312-314 Baker St.  
East Entrance  
Panhandle of Park

RIDE  
**LOVELL DIAMOND**  
BICYCLES  
GOLDEN WEST  
SAN FRANCISCO SPECIAL  
1896  
CAL SPECIAL DIAMOND  
BIKE SPECIALTIES  
WHEELS  
SEND FOR CATALOGUE  
L.S. MARTEL & CO  
411 1/2 CAL ST  
SAN FRANCISCO  
CAL  
AGENTS WANTED

THE BEST  
**SI-KO-LENE**  
LUBRICANT  
ON EARTH  
FOR  
CYCLE  
CHAINS...  
TRY IT!  
JOSE E. SHEARER  
INVENTOR OF SI-KO-LENE

N.B. WRITE FOR CATALOGUES.  
WE MAKE A SPECIALTY OF  
WHOLESALE WHEELS.

THOS. KENT  
FOR  
BICYCLE  
CLOTHING  
597 MISSION ST.  
San Francisco



THE SPEEDY  
PINK AND  
BLUE  
THE  
REINFORCED  
FELLOES  
THE MARCH-DAVIS  
CYCLE CO  
CHICAGO  
The MARCH-DAVIS CYCLE CO  
J.G. FRENCH  
PACIFIC DIST. MANAGER  
W.B. FAWCETT  
RETAIL MANAGER  
739 MARKET ST. San Francisco Cal.

NATIONAL  
AND  
"DEERE"  
BICYCLES  
DEERE IMPLEMENT  
CO.

TYLER BEACH PROPRIETOR  
Geo. H. BEACH MANAGER  
**ST. JAMES HOTEL**  
SAN JOSE, CAL.  
OFFICIAL LEAGUE  
HOTEL.  
REGULAR RATES, \$2.00 to \$3.00 Per Day  
RATES TO CYCLERS, \$2.00 Day

IF YOU RIDE  
WHY NOT RIDE  
THE BEST  
FOR 16 YEARS  
THE  
MOST RELIABLE  
OF ALL  
BICYCLES.  
**VICTOR BICYCLE**  
OVERMAN WHEEL CO.  
MAKERS  
309 LARKIN ST.  
SAN FRANCISCO  
OAKLAND  
LOS ANGELES

ARISTO,  
DIANA,  
OUTING AND  
COURTLAND  
BICYCLES.  
AGENTS WANTED  
**I. J. TRUMAN & CO.**  
236 BUSH ST. - MILLS BUILDING  
SAN FRANCISCO - CAL.



**MAP OF CALIFORNIA  
ROADS FOR CYCLERS**  
ROADS FOR CYCLERS  
**COOPER CYCLE CO.**  
CITY AGENTS  
RENTING,  
REPAIRING  
AND  
RIDING SCHOOL.  
**BARNES' SPECIAL**  
COR. BUSH AND  
DEVISAN  
SAN FRANCISCO

neatline  
ANTIQUE MAPS  
SAN FRANCISCO, CA  
Rare and antique maps,  
no reproductions  
Contact us  
www.neatlinemaps.com  
+1 (415) 717-9764  
michael@neatlinemaps.com