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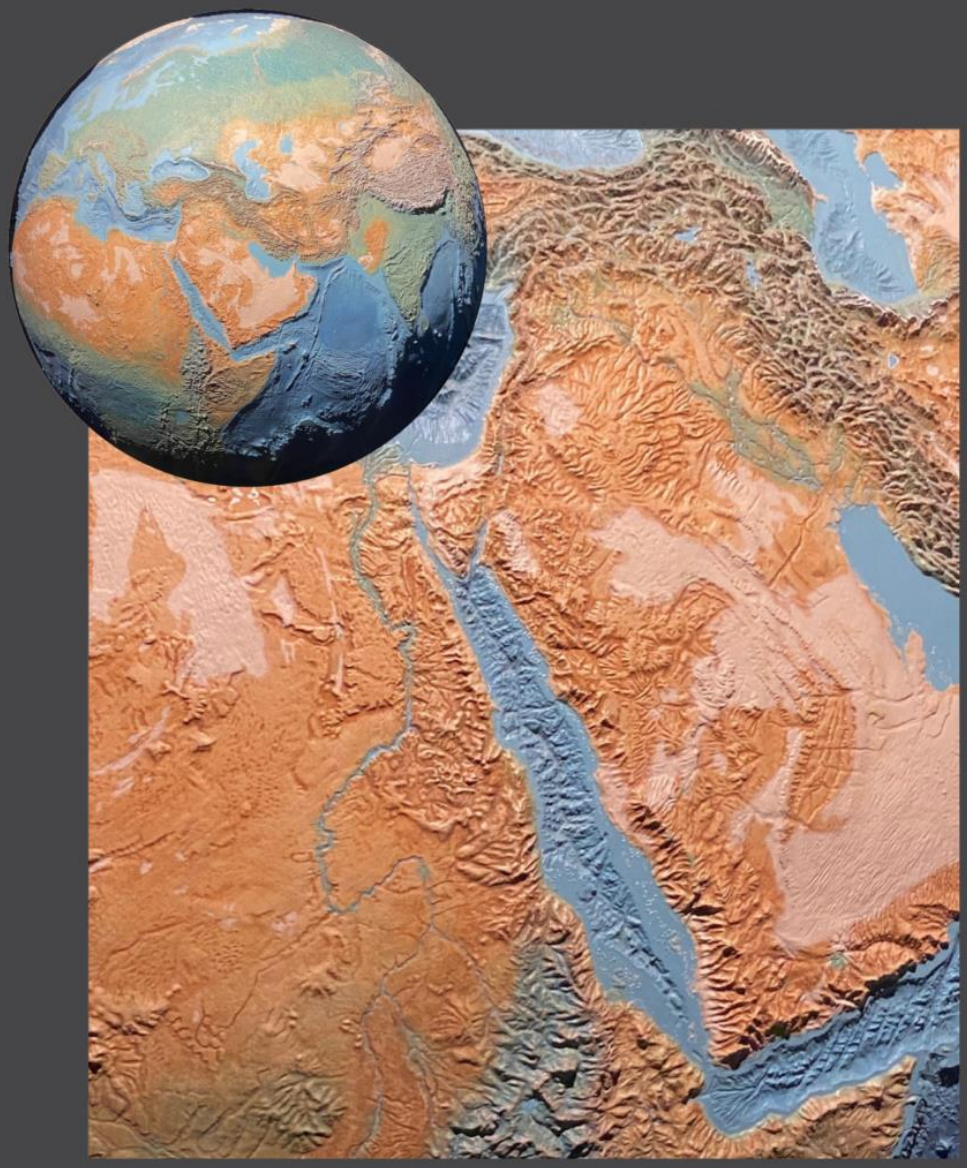

Rand McNally 75-inch Raised Relief Globe at Fleishmann Planetarium & Science Center, *see p. 21*

Source: *Calafia, The Journal of the California Map Society,* September 2024

Tactile Maps: Exploring the World by Touch

Christina Daniels, Greg Kehret & Naomi Rosenberg

Blind and low vision people are deprived of the information provided on visual maps. As a result, they are left out of experiences that deepen understanding, broaden perspectives, and inspire engagement with the world that maps provide. But, when maps are designed in an accessible format, non-sighted people can use them as an effective tool to get information about their surroundings and to experience the art of maps. Tactile maps are incredible accessibility tools for the blind. You might find them at a park showing the layout of various trails or in a booklet with each page detailing different parts of an expansive college campus.

The Media and Accessible Design Lab (aka the MAD Lab), a social enterprise of the LightHouse for the Blind and Visually Impaired in San Francisco, specializes in the design and production of accessible maps for blind and low vision people. Comprised of an experienced team of designers and alternative format specialists, the MAD Lab's approach includes input from people who are blind and low vision, ensuring that inaccessible experiences are turned into inclusive ones.

The MAD Lab produces accessible maps in the form of tactile maps, which convey a variety of information such as campuses, hiking trails (*Fig. 1*), transit routes (*Fig. 2*), floor plans, and more. They also run TMAP, a tool for creating simple, tactile street maps.

Tactile maps allow the user to explore information contained on a map by touch. They contain raised lines, textures, symbols, and braille.

Figure 1. Map of Battery Alexander – Golden Gate National Recreation Area, National Park Service. UV printed, 24 by 18-inch map and key, containing Rodeo Beach, Battery Alexander, Marin Headlands Visitor Center, and Point Bonita Lighthouse.

Figure 2. Finger on tactile BART system map, an embossed paper product with raised lines, braille labels, and full-color graphics.

Some considerations a designer of maps for the blind must make are similar to those when designing visual maps. What age group is the map for? Is the map going to be one that people can carry around, or will it be mounted in place at a museum or on a trail? Other considerations are specific to designing maps for the blind. To start, tactile maps are not accessible digital maps. They are physical, and physical media has parameters around size, scale, and production method. For instance, braille is not a scalable font; it is always the same size and optimized to be read with the pads of the fingertips.

Visual acuity is much higher than tactile acuity, so less information can be included on a tactile map than on a visual

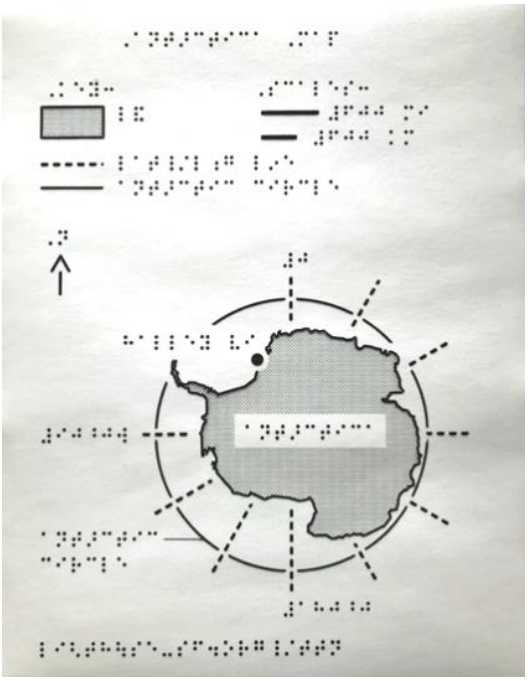

Figure 3. Detail map of Antarctica showing A-74 Iceberg location, with scale lines, lat/long lines, location of Halley VI Research Station, and labels for Weddell Sea and Brunt Ice Shelf.

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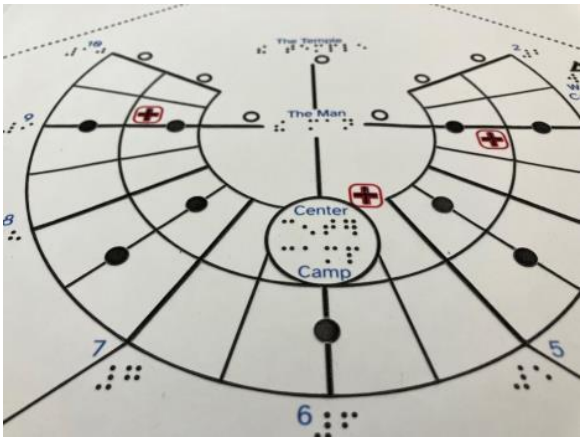

Figure 4. Burning Man map on Swell paper, depicting the layout of Black Rock City, its main points of interest and basic facilities, with raised lines, symbols, and braille labels.

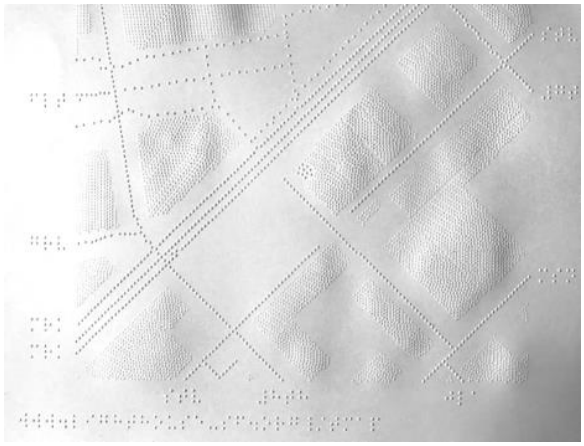

Figure 5. Tactile street map example with raised lines for streets, braille and location dot. (*dot not shown on Detail)*

map. Tactile maps must be simplified, presenting only the essential information that a blind person needs. Consider designing a map for a student that shows classroom locations along a hallway. One way to present this information is to illustrate the corridor with the opposing walls as raised lines and openings into each room labeled with braille. A simplified approach, involving less tactual information and thus a lower cognitive load for the tactile reader, would be a diagrammatic strip map, the hallway represented by a raised line and braille labeled tick marks denoting the rooms. Clutter is the enemy of legible tactile, and even adding braille labels can introduce clutter. For example, braille cannot be overlaid atop a raised line the same way text can be superimposed on an image.

Vision loss is a spectrum; only about 15% of people with a visual impairment are totally blind. (https://www.afb.org/blindness-and-low-vision/eye-conditions/low-vision-and-legal-blindness-terms-and-descriptions#TotalBlindness). For someone that cannot read standard print, even with their best -corrected vision, navigating the small print on standard maps with magnification is cumbersome, makes eyestrain prevalent and muddles map comprehension. Additionally, some low vision people cannot read print at all. Non-sighted people may use a combination of visual and tactile methods to read an accessible map. The MAD Lab combines large print, high-contrast visuals, and tactile elements together on one map. A map with large print labels and bold colors will be useful to some low vision people. But for those accessing this information entirely by touch, texture is paramount. Information on a map can be conveyed tactilely by applying different raised textures, line types, symbols, and labels to each feature. (*Fig. 3, prior page*) The beach may be represented by fine, dotted texture, water by raised, wavy lines, and roads by thick, solid lines.

Custom tactile maps are time-intensive and often too costly to produce for a single map reader. There is a more affordable solution: TMAP. TMAP (Tactile Maps Automated Production) is a web app that creates tactile street maps for blind people by using Google Maps search information and OpenStreetMap data to generate tactile and visual representations of streets centered on a location the user specifies. TMAP allows for affordable and quick tactile map creation, mirroring some of the benefits of Google Maps for sighted users.

TMAP was invented in 2003 by Dr. Joshua Miele, MacArthur Fellow. From 2004 through 2014, Dr. Miele partnered with the MAD Lab to produce and distribute TMAP tactile maps. After a period of going dark due to expended grant funding and aging technology, TMAP was resurrected in 2017 with new funding and technologies. TMAP was one of the projects the MacArthur Foundation cited as a factor for awarding Dr. Miele the MacArthur Fellowship in 2021.

TMAP depicts streets, pedestrian paths, and railways, so the users get the street grid of an area at the scale of a neighborhood. The address or point of interest (POI) appears as a raised dot at the center of the map. The maps contain braille, large print labels, and visual and tactile graphics.

TMAP can generate maps at various scales, from 1:1500 to 1:50000, from a few blocks to a few miles wide. The smaller the scale, the more zoomed in, the less dense and simpler the map. The greater the scale, the more zoomed out, the larger the area encompassed, but also the more tactile density. Choosing the scale depends upon the user's level of tactile literacy and the density of the area mapped.

To use TMAP, users enter an address, intersection or landmark into a search bar, then choose map settings and features, then generate the map file. This file can be printed in two ways. One, the file can be sent to an embosser, a device that creates a raised impression (*Fig. 5*) on a paper using pressure. Two, on microcapsule paper. The microcapsule will have a one-dimensional version of the map printed on it and then be run through a PIAF or Swell Machine, which will raise the

lines of the microcapsule paper using heat.

Tactile maps can be printed by the user at home if they have the equipment. Alternately, for a fee, LightHouse's Adaptations Store (https://adaptations.org/) can ship TMAP tactile street maps to them.

Besides improving spatial awareness and providing the user with the orientation of an area, the user can choose how to navigate the streets just as they would with a print map, giving them the option of learning several routes to their destination. Even exploring a map of a familiar neighborhood can lead to revelations. Dr. Miele spoke on this phenomenon. "The number of people who would actually weep tears, when they felt their first map, a map of their neighborhood that they know and love, was surprisingly high. It's not just the information that has an impact on people's lives; there's a sense of empowerment and also emotional connection to the geography that's being shown."

Jerry Kuns, a longtime TMAP user and supporter of the MAD Lab, explains the freedom of being able to explore a space instead of following exact directions that take him from point A to point B. "Having a beer in one hand and an accessible map under the other is a most satisfying experience. Graphic location information allows me to experience where I am in the spatial environment, which is so much more powerful than only turn-by-turn directions. I wish I had one of the Chelsea District where I arrived in NYC recently. I would be much more willing to explore the area independently and have confidence in returning to my hotel. I even learned some new things about the neighborhood in which I have lived for thirty years upon obtaining a TMAP of the area."

Maps, no matter what form they take, are about exploration. Sighted people explore a map with their eyes, while blind and low vision people explore tactile maps with their fingers. The LightHouse for the Blind and Visually Impaired states, "We take pride in our ability to navigate our lives as blind and low vision people" as one of their values (https://lighthouse-sf.org/about/our-mission/). The MAD Lab's contribution to fulfilling this value is through the creation of maps that blind people can use to navigate themselves.

Christina Daniels, Manager of Publications at LightHouse, is a graduate of San Francisco State University. She has served on blindness/disability-related boards for the past 10 years. She is an avid fan of musical theater.
Greg Kehret is the Director of the MAD Lab at LightHouse. Working in the field of blindness for 20+ years, he came to the profession through a childhood friend who was blind.
Naomi Rosenberg, Assistant Director of the MAD Lab at LightHouse, directs design and production of tactile maps and graphics. Naomi holds a M.Arch from UC Berkeley and a BA in Studio Art from Oberlin College.

Rumsey Center News
First Half of 2024
Green Library, Stanford University

The Rumsey Center presented several interesting programs during this past spring:

Workshop: Urbano Monte 1587 World Map 5-17,18
The map was digitally assembled from separate sheets of an atlas by the Rumsey Center. The map is one of three surviving manuscript copies. It shows us how an armchair traveler viewed the world from Milan at the end of the Renaissance.

OldMapsOnline & TimeMap 5-15
The Center featured the public launch of the next generation of OldMapsOnline with TimeMap. The program allows users to discover the past through over one million digitized ancient maps, viewable in 3D and augmented reality.

A Stranger Quest 4-1
The Center presented a special first screening on the West Coast of *A Stranger Quest*, a documentary by award-winning director Andrea Gatopoulos about David Rumsey's 30-year endeavor to build one of the world's largest map collections.

Game Maps & Glitches 4-2
In this short history of maps in video games, the program explored how they have organized and evolved not only to sort out data and orient players, but also to respond to the mysteries of life and the human condition.

Guided tours of the Rumsey Center are held most Fridays, 2-3 PM. Registration: https://tinyurl.com/3s2w279w
The Center is open to the public on Wed and Thu 1-5 PM and On Fri 9:30 AM to 5 PM.

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