

Mercator at the Crossroads

N41 degrees 52.765 minutes,
W87 degrees 37.487 minutes,
Altitude 847 Feet

By Francis A. Lackner, Jr.¹

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² Wikipedia contributors, "Gerardus Mercator," *Wikipedia, The Free Encyclopedia*, https://en.wikipedia.org/w/index.php?title=Gerardus_Mercator&oldid=877916345 (accessed January 22, 2019)

“Where am I?” The obvious answer would seem to be “at the lectern of the Chicago Literary Club, on the 22nd floor of 200 South Michigan Avenue, Chicago, at 41 degrees 52.765 minutes North latitude by 87 degrees 37.487 minutes West longitude at an elevation of 847 feet above mean sea level.”³ True enough, but there’s more to it than that.



“From 22,000 miles above its surface, the planet earth spins into view out of the black void of deep space. The sun’s rays illuminate its surface, its ocean floors sparkle ultramarine blue, the continents a beguiling patchwork of greens, browns, and pinks. North America, Europe, the Middle East and central Asia curve round in a crescent through the right-hand half of the globe. The Atlantic Ocean

dominates the bottom left, giving way to the tip of North America, with the brilliant white sheet of Greenland nearly crowning the planet’s apex, looming over the North Pole. [The stars appear in the heavens surrounding the planet.] This is a vision of the world as Plato imagined it nearly two and a half millennia ago in the *Phaedo*, a gleaming, perfect sphere, ‘marvelous for its beauty.’ It is the *oikoumene* that Ptolemy projected on his geometrical grid in the second century AD, the globe that Mercator plotted onto a rectangle nearly 500 years ago, and the image that NASA captured in the earthrise photograph from the moon.”⁴ It is this image that you see now. Watch now as we fly on the back of Google Earth.



The geographic truth of location has a long history, reaching back before Ptolemy, with religious, political, economic and scientific overtones that many of us fail to realize. The lenses through which I have chosen to discuss that history tonight are Geert de Kremer, aka Schellekens⁵, and his modern-day equivalent, Google Earth. Both have transformed our

³ Google Maps, 2017

⁴ Jerry Brotton, *A History of the World in Twelve Maps*, Viking Press, 2012, p. 403

⁵ Jerry Brotton, *A History of the World in Twelve Maps*, Viking Press, 2012, p.219

understanding of the world, and both have served both as catalyst and instrument of the changes in their era.

All map makers and geographers have essential problems to resolve:

- Our Earth is an oblate spheroid. Much of geographic history revolves around discovering that fact and attempting to then reduce that spherical geometry to a flat plane document capable of reproduction. Mercator's was the most successful rendition and despite attempts to dislodge him, remains so to this day.⁶
- Maps are an attempt to impose order on the world around us; that world is partly physical, i.e. geographic, and partly mythic and religious, i.e. cosmological. Maps thus tap into some of the deepest fears and beliefs of mankind, even today being disputed on lines of gender, social, economic, and political equality. Geography is a well-spring of belief, as evidenced in the Hereford Mappamundi of the 12th century, or the oldest known world map on a pottery fragment from Iraq, or the Peters Projection of the 1970s.
- The knowledge of location can be extremely powerful, whether you are a general trying to win a battle, a king trying to corral unruly nobles and impose central government and taxes, or a commercial enterprise trying to find customers and distribute products. The mapmaker thus becomes a catalyst for events and movements seemingly beyond their powers. The power of Portugal, and then Spain, derived in no small part from the work of the geographers employed by Prince Henry the Navigator as his captains brought back increasingly accurate portolans from their voyages of discovery. The power of Amazon and Google equally derive from the knowledge of *your* location.
- Even the orientation of the map, and the centering of it undertake inherent issues: is North at the top of the map? East? South? Is a religious center, such as Jerusalem, at the center of the map? Or should a national capital, such as London, prevail? Maps project power. The size and shape of the continents and seas seemingly have little influence in this regard. In this electronic age, the user's location becomes the center of the map, and the orientation becomes the direction in which the user is travelling. North becomes irrelevant. Thus the individual is paramount.
- What should be included, or more importantly, what left out? No map can include every detail at full scale, and thus physical features must be edited. Likewise, the problem of flattening the spherical earth involves substantial editing of the polar regions in particular. The cosmography of the society will also dictate editorial decisions. The graphic elements such as color and the size of text fonts can be important political statements. Note the interest in Red and Blue states in our current politics, a division brought on by television's graphic needs on an election map of the 2000 presidential contest and detailed in a fascinating paper by Chuck Ebeling.

The answers to these problems indicate the underpinnings of the society of which the mapmaker is part. That therefore brings up a question: what is a map? Is it simply a collection of symbols indicating the placement of physical features or political boundaries? The definition has been a

⁶ <https://mail.google.com/mail/u/0/#inbox/FMfcgxvzLNWRvCHRbPnKtzRjTrdbqCT>

contentious subject, especially as we embark on the 21st century with Google Earth and the opportunities it offers. The latest official pronouncement is that, “Maps are graphic representations of things, concepts, conditions, processes, or events in the human world, which naturally extends to celestial cartography and to the maps of imagined cosmographies.” (Woodward 1987)⁷



⁸The first known map of the world is contained on an Assyrian clay tablet, circa 700 BCE, twelve by eight centimeters, Babylon is at the center, expressing the power and centrality of the empire it depicts.⁹ It is a map of the world, looking down on the earth from above, and thus the direct antecedent of Mercator and Google Earth. Like many subsequent maps, it has a cosmological component as well as the geographical: the geographic map of Babylon and environs is surrounded by a salt sea, and in the areas beyond that, cosmological references to Marduk and Ti’amat, thus conferring arcane, magical power on the mapmaker and the rulers who commissioned him.

¹⁰Modern mapmaking was born in the ruins of the Library at Alexandria. Drawing on hundreds of years of Greek thinking, Claudius Ptolemaeus wrote the *Guide to Geography*, known simply as the *Geography*, in about AD150, in which he laid out the principles of cartography that still shape our view of the world today. Ptolemy laid out the mathematical, astronomical basis of measuring the earth, establishing the time-based system of longitude, and the astronomical basis of latitude. He laid out the duties of the



geographer in observing the “known world as a single and continuous entity, its nature, and how it is situated, by taking account only of the things that are associated with it in its broader,

⁷ Quoted in Brotton, *ibid*, p.5

⁸ Alarmy stock photo G1CE11

⁹ Brotton, *ibid*, p. 3

¹⁰ Wikipedia contributors, "Ptolemy's world map," *Wikipedia, The Free*

Encyclopedia, https://en.wikipedia.org/w/index.php?title=Ptolemy%27s_world_map&oldid=870408947 (accessed January 22, 2019).

general outlines.” The Geography was a monumental work that defined geography then and for the next 2000 years.¹¹



From Ptolemy in second century Alexandria, the next significant contribution comes in twelfth century Sicily, at the court of Roger II, the Hauteville King of that crossroads Mediterranean¹² island. In Roger’s person, the Normans of France, descendants of the Vikings, had established themselves at the center of the Mediterranean. Drawing on the Norman custom, Roger assimilated much of the culture he found, and it was a rich mixture of Roman Christian, Byzantine Roman, Arabic Islam, with a foundation in Greek and Roman culture. To this mixture he invited Abu Abdallah Muhammad ibn Muhammad ibn Abdallah ibn Idris al-Sharif al-Idrisi, more commonly al-Idrisi, an

eminent Arabic scholar and traveler, to create a comprehensive summary of the known world, the *Entertainment for He Who Longs to Travel the World*, usually known as the *Entertainment* or *The Book of Roger*. With south at the top of the map, it looks odd to modern eyes, but was the most sophisticated compilation of worldly geography to appear before the Renaissance.

A product of the *Convivencia*, or peaceful co-existence, of Roger’s court, the *Entertainment* was one of the great works of medieval geography, “one of the finest descriptions of the inhabited world compiled since Ptolemy’s *Geography*” a thousand years before. “It drew on Greek, Christian, and Islamic traditions of science, geography, and travel to produce a hybrid perspective based on the exchange of cultural ideas and beliefs between different faiths.”¹³

Hereford Monastery in Wales houses a 13th century Mappamundi that is antithetical to both the *Geography* and the *Entertainment*, and certainly to anyone familiar with Google Earth. Hereford is now a country backwater perhaps more consonant with dairy cows, but in the 13th century it was part of the hot conflicts between the England of Edward I and the border lords of Wales.

¹¹ Brotton, *ibid*, pp. 47-49

¹² <http://genius.bodleian.ox.ac.uk/exhibits/browse/nuzhat-al-mushtaq-fi-ikhtiraq-al-afaq-entertainment-for-he-who-longs-to-travel-the-world/>

¹³ Brotton, *ibid*, p.55



One of Edward's principal bishops was Thomas Cantilupe, who ¹⁴got into trouble with the Archbishop of Canterbury over the practice of pluralism. Hereford was Cantilupe's cathedral, and when he died, the Mappamundi remained, and stays to this day. The Hereford Mappamundi is unlike any other. It is large, at 5 feet 2 inches high and 4 feet 4 inches wide and made from one single animal skin. It is oriented with East at the top, making it again strange to modern eyes. To quote Jerry Brotton, "This map emanates an almost organic aura, embodying a chaotic, teeming world, full of wonders, but also edged with horrors." For the creator of this map, the religious

underpinnings were as important as the physical, and thus one finds a circular depiction of the world, in one vast sphere, surrounded by water. A modern viewer is left baffled by the distribution of land and locations, but that was not the point for this artist. For him the cosmology and classical references were at least as important, and thus one finds the columns of Hercules, references to Daedalus placed next to Crete, the Colossus at Rhodes. The further from the center of the map, the more the map diverges from reality, with monsters and effigies abounding toward the edges. "The essence of the Hereford Mappamundi is contiguity, the proximity of one place to another, each one charged by a specific Christian event. It is a map shaped by its religious history, connected to specific places, rather than geographical space."¹⁵¹⁶

I can't slide by a word as delicious as Mappamundi without offering the origin and meaning. It derives from the Latin *mappa*, tablecloth or napkin, and *mundus*, the world. It originated in the eighth century AD in the Christian West. Originally it could refer to a map, but also to any

¹⁴ Wikipedia contributors, "Hereford Mappa Mundi," *Wikipedia, The Free Encyclopedia*, https://en.wikipedia.org/w/index.php?title=Hereford_Mappa_Mundi&oldid=868802709 (accessed January 22, 2019).

¹⁵ Brotton, *ibid*, p. 107

¹⁶ Brotton, *ibid*, p.85

written geophysical description; only later did it achieve the specialized meaning of a map of the world. Given its derivation, the plural is *Mappaemundi*.¹⁷

¹⁸The Renaissance is not the purview of this essay—I've already bitten off enough to chew on for one evening. Suffice to say that the rediscovery of the cultural treasures of Constantinople and the East, the hugely profitable spice and silk trade centering on Venice, and the Crusades, all combined to direct voyages of discovery that drew together the disparate world. The general shape of the voyages initiated by Prince Henry the Navigator to

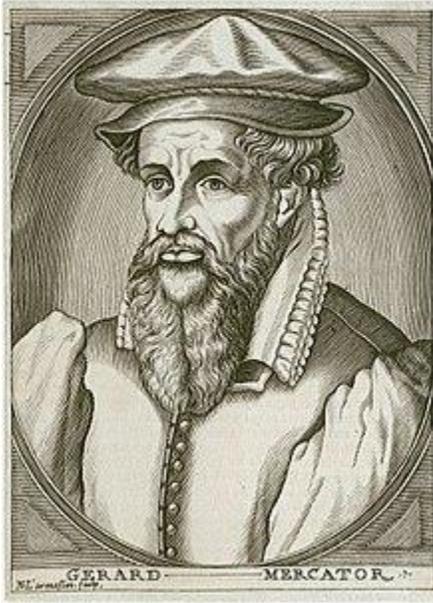


circumvent the Arab and Venetian lock on the spice and silk trade expanded the economic development of Portugal, Spain and ultimately Europe. Integral to those voyages were the portolans, or charts and sailing directions, that the captains and navigators of those expeditions used to record and navigate their new finds, each one building on the prior effort. These portolans were closely guarded state secrets, much like the knowledge of atomic physics in our day, that provided power to rulers and rewards for the daring of the navigators. As the Renaissance moved northwards, so too the knowledge of the world and the trade routes. The Dutch, natural sailors, were early opportunists. The Dutch were ruled at that time by Hapsburg Spain; that knowledge of Spain's trade routes would have flowed naturally to the Dutch, and that brings us to Geert de Kremer, aka Schellekens, later known by the name he selected, Gerardus Mercator.

¹⁷ Brotton, *ibid*, p. 84

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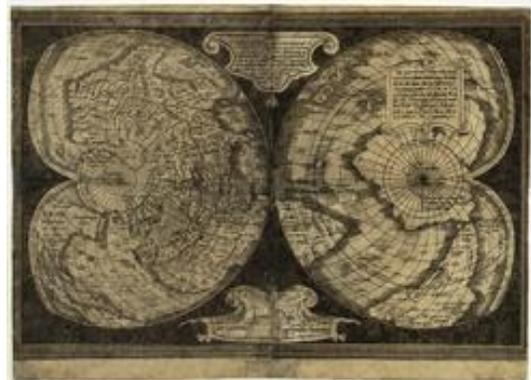
https://www.google.com/search?q=portolan&rlz=1C1CHBF_enUS753US754&tbm=isch&tbo=u&source=univ&sa=X&ved=2ahUKEwj3rabB8YHgAhXm5YMKHYHdD3EQiR56BAgFEA8&biw=1228&bih=872#imgrc=vjhPAex1y17XEM:



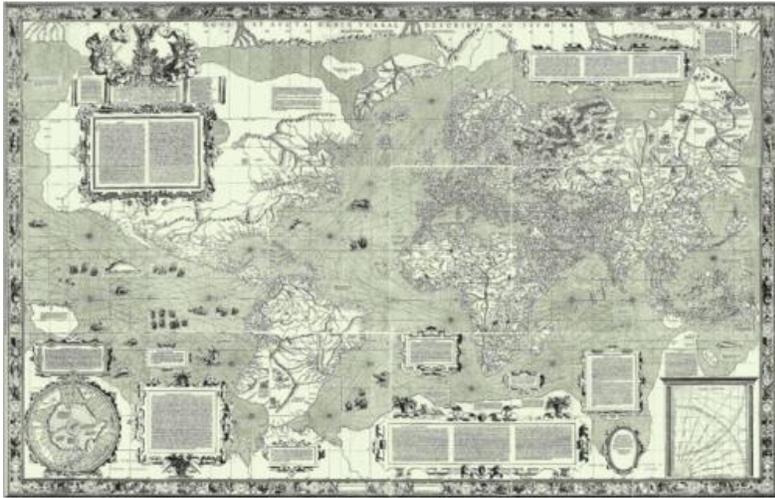
Geert de Kremer started life the son of a farmer/cobbler on March 5, 1512, in [Rupelmonde, Kruibeke, Belgium](#) in the Rhine-Meuse-Scheldt delta region of East Flanders, twenty kilometers south of Antwerp. We know his birth name due to an arrest warrant for heresy issued in the religious conflicts of the early Reformation; it was that religious belief that shaped his early life and education. Catholic by birth, he was clearly captured by the Lutheran heresy, although he never declared himself as such, and remained a devout Christian to the end of his life. He was educated at the University of Leuven, with which he maintained a connection throughout his life, greatly enjoying debates there on a variety of subjects: theology, philosophy, history, mathematics and geomagnetism as well as being an accomplished engraver, calligrapher and maker of globes and scientific instruments. These last, making globes and

printing maps, were the source of his fortune, and he was respected all over Europe for his skill and accuracy.

One of his early efforts at age 26 was the World Map of 1538. This wall map has no title, but it is normally referred to as *Orbis Imago*. It is the first map identifying North America and South America. The double cordiform projection may well have been chosen because of its relationship to aspects of Lutheran beliefs. A notice to the reader (Latin text) at the top of the map says: "Let America, Sarmatia and India bear witness, Dear Reader, that the image of the world you see here is newer and more correct than those that have been circulated hitherto. We propose with regard to the different parts of the world to treat, successively, particular regions more broadly, as we are already doing with Europe, and you may soon expect a universal map, which will not be inferior to that of Ptolemy." Ego was not lacking then, as it remains today—ask Elon Musk.



His greatest achievement and enduring legacy was the Mercator projection: a conformal map



projection of which the meridians are drawn parallel to each other and the parallels of latitude are straight lines whose distance from each other increases with their distance from the equator.¹⁹ The 1569 world map was based on a new projection which represented sailing courses of constant bearing as straight lines—an innovation that is still employed in nautical charts.²⁰

Mercator, like any good lens, allows us to see instructively in many directions. As Schellekens, we can look back to the cosmological, religious based maps of the past. As Mercator, meaning *trader*, the name he adopted later, he embodies the Reformation, the Renaissance, the rise of printing, and the rise of Dutch trading fortunes. Finally, as the printing press is the antecedent to the computer, Mercator is the forerunner of Google Earth. In Mercator the cosmography of religious cartography was thereby concluded and the scientific approach to the understanding of our physical universe was launched that has prevailed since. No other geographer before or since, apart from Ptolemy, has had a greater influence on our understanding of our place in the world and the cosmos until the advent of Google Earth.

Although Mercator had, by the midst of the 16th century, mapped the large contours of the world, the interior spaces of the continents were not so amenable to mapping. It's one thing to draw the outlines of the world in your study from the reports of returning seafarers; another thing altogether to tromp up hill and down dale for the specifics of local roads, towns, mountains, watercourses, and political subdivisions. Succeeding waves of cartographers took on the challenges of mapping what we now know as Holland, Flanders, and Belgium. The interest in mapping spread to France, where it had a hand in causing the primacy of the central government under Louis XIV, the decline of the nobles and the increase of taxation that led to the French Revolution. England followed during and after the French Revolution, reacting to the French advances. Thomas Jefferson, in particular among our founders, recognized the value of geographic knowledge early on, as part of the American Revolution while he was minister to France. That led directly to certain seemingly obscure clauses in the Constitution, and to the Corps of Discovery headed by Lewis and Clark.

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¹⁹ Google Search summary question "Definition of Mercator Projection"

²⁰ Google Search summary panel for Gerardus Mercator

Maps continued to gain accuracy and detail through the 19th and 20th centuries, but they were tied to their paper antecedents. The advent of the computer, and in particular the personal computer, the Internet, and the portability of the smartphone, have revolutionized geography and mapmaking again. As the Renaissance could not have happened without the printing press and the rediscovery of the ancient texts brought from Constantinople and the Arabic East, so too the computing power of the microchip, the interconnection of the Internet and the portability of the smartphone have fused to create an altogether different view of the world and the function of geography.

Maps have always functioned to describe the world about us, but it took skilled eyes to orient a map to the physical features on view. No more: with a smartphone and a connection to the Internet, one has a map, certainly. But that map will locate the viewer to their specific location; it can be scaled down to the few feet nearby or scaled up incrementally to include the entire world. It can provide photos of places near and far, find businesses of interest and the homes of friends, and then provide a telephone number and call them. There are reviews of businesses. Maps will provide directions to any destination, with alternative routes by air, automobile, rail, public transportation, bicycle, or on foot, and provide incredibly accurate estimates of the time required to reach that destination. Adding an intermediate stop, or several of them, is no issue. While enroute, the map and directions will be updated to the latest traffic or other conditions, and the suggested routing may change several times in the course of a trip. That traffic information is aggregated from public agencies and from thousands of other travelers, all contributing their location, speed and direction, so that each benefit from the whole while making the whole more accurate. In the process, as many local neighborhoods have discovered to their chagrin, local streets and shortcuts have become favorites of drivers using electronic maps. Weather is a constant variable in our lives, and again displayed as a map on your computer or smartphone, can advise not only the current and expected conditions, but can display radar images of storms, again on a scalable map, and warnings of imminent changes. “Looks like rain” we used to say while gazing at an incoming cloud bank. No more: now your weather forecast will say, “Rain expected in 9 minutes” and show a radar map that includes the intensity of storms to the nearest block. There are a multitude of specialized computer programs that rely on mapping technology to control the movements of truck and rail fleets, with the location of each truck, container, or rail car noted; real-estate apps like Zillow will advise the expected price of any home or apartment and place it on a map, with photos and details of the property, including taxes, schools and a price history of past sales.

The scale of these maps starts with your doorstep, expands to your neighborhood, city, state, nation; they detail the ocean floors and expand to map the cosmos. What all of these programs have in common is that they depend on a map, commonly but not necessarily Google Street Maps or Google Earth, as a backbone. To that framework they then attach the particulars of their specialty, whether it is weather, real estate, fleet management, retail sales, or social networks. The map is specific to your location, or your selected location, using GPS and GPS transponders.

It is all connected through the Internet so that the map is current and adapted to the specifics you require.

Depending on your point of view, you may find this technology intrusive or exciting. It is, however, here to stay, much as the printed book was disruptive to the established order of its age. Martin Luther would have been a minor heretic but for the printing press; with it he started the Reformation.

It is this connection in real time of maps, computers, location, and commerce that makes this revolutionary. Once again, maps are the catalyst to the changes in society. It is always tempting to predict the future, but a prior paper of mine proved the folly of specific forecasts. Instead, I offer some general observations:

- Maps will continue to become more personal and portable. That means more portable for the user, but also more attuned to the individual's needs and interests.
- The social context of a map will become more important. The successors to Facebook and Twitter will offer to not only connect you to friends and associates, they will arrange meetings and meetups based on the location of both you and your friends. Our own CLC mobile app already has this capability.
- Maps come with issues:
 - Unregulated and/or unscrupulous software developers create software, using maps as their base, that sometimes violates established property and privacy rights. Recently Niantic Inc created a game for subscribers with smartphones based on Pokemon Go, a popular digital game, that had enthusiasts invading public memorials and private homes in search of their augmented -reality characters' locations. The lawsuits for invasion of privacy against Niantic are wending their way through the courts even now.²¹
 - One of the current issues for 911 call centers is locating callers accurately, and this is primarily due to the various technologies employed: satellites, cell towers, Wi-Fi networks are all separate, hampering the location of victims both horizontally on the ground, and vertically within high-rise buildings in cities. The FCC has mandated that cellular providers be able to locate their subscribers with more accuracy in the near future. Combining these resources will dramatically improve the ability of these call centers, but of course at the cost of privacy. Tradeoffs abound.
- They are already linked to the other functions on your device, and this will only intensify. The apps will also be carried on multiple devices you own and will make the transfer of information from one to another increasingly seamless as you change from use of your phone to your tablet to your computer. You can already establish the route of your trip on your home computer, transfer that to your smartphone, and then connect that phone to your car's navigation system.

²¹ <https://mail.google.com/mail/u/0/#inbox/FMfcgxwBVqLXNWJFBBFzrpbVfgBFGGSJ>

- That functional cross-fertilization will include your transportation in the future. Autonomous vehicles, including self-driving cars, are based in part on detailed maps and the ability of the vehicle to relate that map to its surroundings. Trucks will likely be the first, especially for long-haul fleets, but passenger vehicles will follow. The same is true for package delivery, where drones may drop off your groceries and other purchases at your front door. Does anyone remember the Jetsons, where a driverless pod appeared on command for transportation?
- Maps will be updated in real time, as you travel, changing your routing as events affect your plans, whether traffic jams or a last-minute request to bring home the milk.
- Maps and devices will become increasingly intuitive to use. Instruction manuals are already a thing of the past. Devices and apps that cannot be instantly useful and connected to others will be rapidly discarded.
- There is still a debate about the utility of paper versus electronic maps. Part of that discussion is about quality, and that involves the amount of resources a map publisher, whether print or digital, is willing to invest in the accuracy of their maps. Another part involves the reliability of the digital resources and communications. A third discussion relates to the most effective means for people to relate to the landscape about them: for a short-term visit, the digital may be more effective, but for a long-term, deeper relationship with an area, the use of a paper map seems to be more effective.²²
- Maps are money. It was true for Prince Henry the Navigator. It's true today: Google Maps is free to use for consumers, which accounts for its popularity. However, businesses and others wishing to generate views of their location and product must pay for the privilege, on a sliding scale per number of views, or "hits," by consumers. The monetization of the information in maps is well hidden from most of us but will only increase over time.²³
- Conversely, one price we have already paid is the loss of privacy. If you know where you are thanks to your smartphone and how to get to your next destination, so too do the controllers of that information know where you are, what you are doing and where you are going.

For example, a map of Seattle located a neighborhood with seemingly-similar income and housing characteristics to those around it, but whose children had a substantially higher success rate in school and college. They proceeded to target that neighborhood with housing vouchers and similar programs to take advantage of that success.²⁴ That same information is available nationwide, by census tract, making it practical for individual families to use.

Privacy will be a major ethical issue for the next generation.

²² https://theconversation.com/why-paper-maps-still-matter-in-the-digital-age-105341?utm_campaign=citylab-maplab&utm_medium=email&silverid=%25%25RECIPIENT_ID%25%25&utm_source=newsletter

²³ <https://www.citylab.com/transportation/2018/09/a-blockchain-based-startup-wants-to-pay-you-to-map/570652/>

²⁴ <https://www.nytimes.com/2018/10/01/upshot/maps-neighborhoods-shape-child-poverty.html>

The Dutch Renaissance, with Mercator as exemplar, has much in common with the tech valley of California in the late 20th and early 21st centuries. They both faced into each of the European and Asian cultures, and their wealth was built on trade between them. Maps were the enabler of the trade routes to the East in the 16th and 17th centuries, as the Internet is to trade and intellectual change in the 20th and 21st. Those who understood that trade profited enormously. Mercator built a name for the ages on his understanding of mathematics and its use in the logistics and marketing of maps, much as Google has built its name and core on the business of searching the Internet—and how curious it is that one of its principal businesses is a world map, built in scale from your very doorstep to star maps of the cosmos and the depths of the ocean.



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As you watch the world turn, it is appropriate to reflect on Mercator’s choice of words to summarize his life, drawn from “a poem by [George] Buchanan (a renowned Scottish historian and humanist scholar, a Lutheran sympathizer, tutor to Mary, Queen of Scots and her son, the future James I of England, and a well-known Stoic), (Brotton 2012) (Brotton 2012):

May you perceive how small a portion of the universe it is
That we carve out with magnificent words into proud realms;
We decide with the sword, and purchase with spilled blood,
And lead triumphs on account of a little clod of earth.
That strength, seen separately by itself,
Is great indeed, but if you compare it with heaven’s starry roof, it is as
A dot or the seed from which the old Gargettian [Epicurus] created innumerable worlds.

How tiny the part of the universe is where glory raises its head,
Wrath rages, fear sickens, grief burns, want
Compels wealth with the sword, and ambushes with flame and with poison;
And human affairs boil with tremendous uproar!” (Mercator 2000)²⁵

²⁵ Brotton, *ibid*, p. 257