We are IntechOpen, the world's leading publisher of Open Access books
Built by scientists, for scientists

5,800
Open access books available

142,000
International authors and editors

180M
Downloads

154
Countries delivered to

Our authors are among the

TOP 1%
most cited scientists

12.2%
Contributors from top 500 universities

BOOK CITATION INDEX
CLARIVATE ANALYTICS
INDEXED

WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

Chapter

Perspective Chapter: Creative Mapping and Mapping Creativity

Stanley D. Brunn

Abstract

Creative efforts showing places and human/environmental features are integral to understanding our evolution of knowledge. Throughout human history, the construction of maps for personal, commercial or political control has been instrumental in displaying food production, faith landscapes, human migration, transportation networks, environmental conditions, human welfare and much more. The visible products about environmental settings and human well-being from prehistoric artists, explorers, cartographers and geographers to those using satellites, GIS and social media reflect rich imaginations about the place and environmental knowledge. Historical creative efforts are addressed as well as ongoing geographic searches and mapping to improve our understanding of the planet's human and environmental features. Creative curiosities about places local, planetary and extra-planetary will forever be part of human histories.

Keywords: prehistory, Europeanization, hyperlinks, geohumanities, imagination, planetary knowledge gaps, unknowns

Geographers on Afric-maps.

With savage pictures filled their gaps.

And o'er uninhabitable downs.

Placed elephants for want of towns.

—Jonathan Swift.

Geographers find maps exude emotion.

About a place or environmental location.

Far less inspiring are the worlds of apps.

Replete with many uninspiring gaps.

—Stanley Brunn.

1. Introduction

All maps are creative efforts as they are designed, prepared and produced by humans, whether children in elementary grades or adults using super technologies. Maps are also information products that contain material the designer or the client, whether a scholarly community, corporation or state, wishes to display. Behind those constructions are many questions about the map designer her/himself, why the map was constructed, the person or organization funding the production and the desired uses of the final product. These why, for whom, and so what questions are foundational in looking at any map considered, constructed and used. Because of the individual, state and corporate incentives behind map constructions, it needs to be recognized that maps themselves represent some creativity. Two or three individuals constructing a map of a region or showing the same specific feature can produce a different map in size and content as well as colors, scales, legends and title. Those variations themselves represent creative efforts on the part of the designer and producer for the intended audience.

What is important to recognize in any map construction is the creative skills and talents the cartographer brings to the task and the final product. Mapmakers or cartographers can be grouped into several categories, including those that have keen imaginations and talents and those that are simply using an existing map or
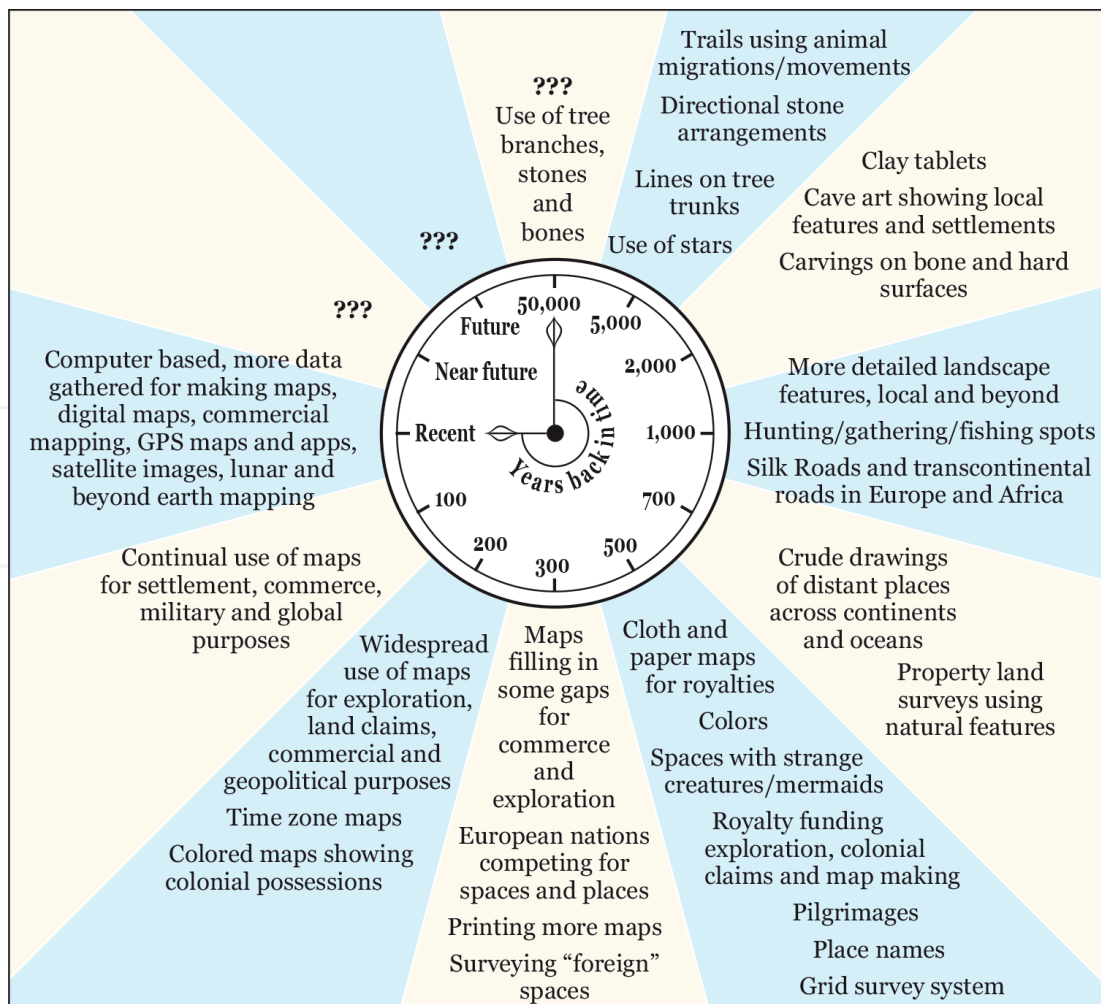

Figure 1.
Evolution of creative mapping: From sticks and stones to GPS maps and apps.

constructing one with only some slight variation in content or projection. There are all kinds of cartographers along this continuum. Those variations in talents were displayed in early cartographers drawing lines on the earth's surface or sketches on cave walls or stone or wood. The early cartographers displayed much creativity in mapping features and colors depicting distances, directions and images of human livelihood and environmental settings. We observe these distinguishing features on maps showing the layout of a village, a favorite hunting ground or fishing spot, sacred landscapes and distant places of enemies. Some early developments in the evolution of human cartography are depicted in **Figure 1.**

2. Early cartographers

Our history of early cartographers has many "gaps," including who they actually were. Perhaps they were a woman or man who exhibited to peers some spatial, esthetic and creative "wherewithal" about places nearby or distant and also displayed those talents in designing tools and weapons, clothing, musical instruments and even reading the stars to predict regular and irregular events. Or they may have been someone with a physical disability who enjoyed listening to stories of someone who eagerly ventured into known and unknown places. Or they may have been those who led hunting and gathering sojourns for daily livelihood or persons of power and leadership who led expeditions into little-known places or military leaders who returned from exploits and provided knowledge that they sought to display on some flat surface. Whoever they were and whatever their purposes were, the earliest cartographers were, like today, both creative in thinking spatially and also seeking how to represent what they observed and learned to satisfy members of some tribe or clan or to advance some commercial or state-powered ambitions.

In describing any creative earth-surface map, it is important to consider and value the early cartographers' ingenuity and ability to depict "place and environment" content in some framework for others to learn from, build on and enjoy. One can look at the construction and evolution of maps and map-making for a very small local forested or grassland area or a coastline or riverine settlement as ongoing efforts to know more about "what is where," but also how to present that knowledge to others for whatever purposes. That use might be to locate safe places to live, good places to fish, hunt and grow crops, places for secure settlements and places to expand and depict place knowledge beyond what the cartographer and/or geographer already knew. Even a cursory examination of early map knowledge in Southern Africa, the Middle East and the Mediterranean displayed on various surfaces (stone, clay, wood, cave walls, etc.) reveals that in the span of several millennia more information was gained about distant places, peoples, landscapes and environments. This accretion of knowledge was gained by those exploring new places and moving into new home spaces and environments, all increasing in an ever-expanding place-knowledge base.

3. European cartographers

Ever so slowly did that accumulated geographic knowledge about human histories begin to appear on more maps. In short, cartographers were beginning to "fill in" some of the "knowledge gaps," some that had persisted and now were "filled" some with the river, a mountain, wildlife or secure place for human settlement.

These increased "place knowledges" appeared on maps produced by states who sent military, commercial and religious expeditions into unknown territories and then returned with new place knowledge. That information the states themselves valued to display political and commercial power and a desire to claim territory for their own prestige and control [1]. In short, maps became not just a source of "surface or flat-earth" information about new places, but official evidence to assert some control and claim over "their" new spaces. Maps as official creative "instruments of power" were used to make claims about places and environments of which they often had little prior knowledge, all efforts to ensure themselves and others that they did not invade their "new spaces of control." During the Ages of Exploration and Discovery, especially beyond Europe and the Middle East, they were constantly competing for extra-territorial efforts to not only gain more knowledge about new and distant places but also to produce detailed and colorful maps that clearly showed state sovereignty. These maps not only depicted their exploratory efforts but also showed their claims over previously unmapped and distant places. These innovative and imaginative colonial expansion maps of "cartographic imperialism" showed possessions, some place name features related to state explorations along coasts, mouths of rivers and distinct physical features such as mountains, deserts and also settlements [2]. Many unmapped indigenous-named features were renamed.

Creative cartography was in full swing during Europe's exploration and discovery history [3]. Maps were among the best ways to show that those in power had firsthand knowledge and control about places for human settlement. And they could display that knowledge on maps (not many until printing presses) for their own constituents. More maps gradually appeared in public places to show military and corporate power and control but also in education settings. These were detailed maps of some regions, such as Europe or eastern North America, but also crudely drawn world maps of the continental interiors of Australia, Africa, Latin America and Asia. Surely, these early world maps were inaccurate by contemporary standards, but they were very important in establishing claims by early European countries funding exploratory voyages and later settlements. These early world maps also were Eurocentric; that is, Europe was in the middle. What was at the "map edges" considered less important? The words "Near, Middle and Far" were used in European labeling of the worlds beyond. This subtle labeling of regions is a legacy that remains to this day with millions associating Europe as "the Center of the world." Consider the contemporary use of the "Middle East" instead of Southwest Asia and "Far East" instead of East Asia. And do not forget where 0-degree longitude exists—in Greenwich, England. Europe was the center of early world map construction and Eurocentric views remain important in world visual news reporting.

Cartographers over the centuries sought to "fill in the gaps," especially gaps in maps of continents. That task has always been a major one for those studying all places on Planet Earth. The first world maps of Africa, North and South America and Asia, as well as oceans, displayed much emptiness. The answer for the Earth-bound cartographer was simple; there was next to nothing known about "what was where." The absence of any knowledge base from a discovery team meant that something "had" to be placed in those blank spaces. Not surprisingly, the cartographer himself (most were men) placed huge whales in oceans, mermaids along shorelines, and imaginary mountains and deserts "somewhere." Strange and huge wildlife creatures (snakes, elephants, etc.) or some strange-looking people were also inserted in places where place knowledge was absent. It was both a terrae and an aquae incognitae.

Increasing human settlement and migration from Europe and evolving cartography gradually filled in many of these gaps with specific information from explorations

into continental interiors, along coastlines, into mountains and also contacts with indigenous peoples. Creativity blossomed with more place names and political boundaries showing territorial claims in lands and landscapes known and unknown, and with Europeans superimposing their own "knowledge base" over any existing indigenous geographical naming. The "Europeanization" of the world did not exist to the same degree in interior Africa, Southwest Asia and Central Asia as it did at local scales in Europe. The European claims and boundaries on maps were often defined by major features such as rivers or mountains. Connecting coordinates by strait lines defined boundaries of territories and colonies in Africa, North and South America and Australia. Place names defining European control and settlement eventually were common in initial and subsequent settlements around much of the world. Not knowing "what was there" or "who was there" was not that important. What was important in a state's raison d'être was establishing a claim before another colonial power and constructing and displaying maps that showed power and control. The Berlin Conference in 1884–1885 of European powers became the defining point in colonial boundary drawing in Africa, the impacts which remain to this day. Maps were used for political, commercial and military purposes as we have observed in boundary and territorial conflicts over land spaces in the past five centuries. These two-dimensional maps still serve as places of conflict, power and control, even in a cyber world.

The creativity behind European mapping efforts of Earth's space extended far beyond their initial uses by the state. Behind those early state-funded explorations into distant places, by Europeans especially, were those in cooperation with the commercial sector. Their goals were to find sources of additional revenue for settlement, wealth and power. These enterprises not only added to their own power, domain and influence but also stimulated competition with other states for prized non-European territorial spaces distant from Europe. These were not simply to find sources for more tropical fruits or valuable minerals but as spaces to spread their culture (political, religious, heritage). Supporting these European efforts were African slaves they brought to the Western Hemisphere in large numbers and European diasporas emerging in South and Southeast Asia, Australia and the Pacific. Each new group of Europeans brought Europeans in contact with existing indigenous populations. The objective was to establish European cultural and political systems. Those explorations were evident in European place names on maps and also in renaming existing indigenous places on European settled landscapes. Again, power was evident in the construction and display of information on a state map. Colonial maps of continents were constructed in English, French, Spanish, German, Dutch, Portuguese and Italian. Continental maps were also creative in using a variety of colors to effectively show spaces and places that are "mine, not yours." The colorful mosaic of political spaces existed into the 1960s and 1970s on world maps showing European colonies in Africa, Asia, the Caribbean and the Pacific. Cartographers employed by governments and companies making maps for school or home use were kept busy constructing maps that reflected name changes associated with independence, but also peaceful and violent transitions resulting from conflicting border claims.

4. A gradual global awakening

Describing and discussing state maps and mapmaking processes and patterns into much of the first half of the last century was much different than the last half [4, 5]. Political maps were often standard in projections, content, topics, symbols and legends.

World political maps showing national boundaries were common as were those showing colonies and results of conflicts. Most changes were about territories and land boundaries. Very few changes were about oceans as they were basically empty spaces with a little depiction of valuable natural resources for minerals and fishing or conflicting boundary claims and areas of regional military conflict except in Europe, Asia and the Pacific. For those in the geography community, maps in textbooks were basic reference maps that showed the names of countries, location of major cities and major physical features such as rivers, mountains, deserts and climates, vegetation types and soil categories. In economic subjects, again the topics were fairly standard: major agricultural regions, mining sites and industrial centers and population numbers and densities. In what today one would call the Global South countries, maps of incomes were usually per capita GNP, which showed wide gaps between the "developed and underdeveloped regions" (these were the labels used). Even a casual examination of research articles and elementary, high school and university textbooks published before 1960 revealed more uniformity than creativity in content. Geography classes using maps at that time were focused on description more than interpretation and were more concerned about what might be called "standardized reference materials" about basic content than any alternative projections or topics or themes that might be termed thought-breaking and creative. Also, of note is that Africa was usually the last world region discussed in world regional texts. Australia was considered before Africa. Oceans, covering three-quarters of the planet, were ignored.

During the late 1950s and early 1960s, former European colonies became independent and adopted new names; they were also the sites of conflicts, some serious, in African, Asian and Caribbean regions. Accompanying these changes were changes in the human face of the world, beginning with some new terminology and topics previously unstudied or understudied. These included maps of rich and poor countries or developed and underdeveloped countries or developed and less developed countries. The labeling of regions changed. New topics such as "economic developments in former colonies" were addressed as were "intra-national and inter-regional conflicts," and "emerging resource-rich regions producing oil, iron and other minerals for the developed worlds." Economic aid for literacy programs, disease outbreaks, new state infrastructure and urban development presented challenges to those preparing maps for the private sector, for states, for schools at all levels, and for a public that was slowly experiencing the end of colonialism and the beginnings of globalization.

Other changes in the cartographic realm were also occurring at this time. Among the changes where how Antarctica was being viewed. The Treaty of Antarctica in 1959 resulted in the carving up of the spaces for scientific study by nation-states. Soon thereafter additional maps showed the expansion of territorial coastal waters accompanying United Nations Law of the Sea negotiations in 1982. These negotiations were related to offshore fishing and oil and gas exploration, the carving up of sea spaces such as the North Sea, measuring pollution levels and defining areas of water conflict. Maps were increasingly being used to show the spread of diseases and tourism sites and cruise ship networks for emerging tourist economies. Three additional groups that emerged as major producers and users of maps for their own constituents were the corporate and environmental sectors and the United Nations. An integral part of the increased globalization efforts of many small and large corporations was to use maps showing the location of consumers or markets as well as potential investments in agriculture, industrial development and especially energy economies. Advertising informed many consumers about the locations, new countries and their pronunciation, profitable investments and new markets. Environmental and conversation

organizations with international contributors expressed global concerns about shrinking natural habitats for endangered wildlife, pollution levels, global warming impacts and human welfare. All used maps to inform their supporters about the need for increased planetary awareness. The United Nations during the 1960s and 1970s was becoming heavily involved in a wide variety of human welfare and human conditions, especially related to issues about refugees, poverty, literacy, political conflicts (especially Southeast Asia), gender disparity and the spread of diseases. All these efforts contributed to a slow global awakening of places heretofore unknown to many residents of the planet.

Many of this human development and planetary awareness efforts included creative maps, not only by cartographers but also by those with training in the arts and photography, computer graphics and the visual humanities. They collectively demonstrated the importance of an emerging "popular cartography" that went beyond the construction of maps primarily for state purposes. Popular journals like the *National Geographic Magazine* were beginning to publish articles that addressed global and planetary issues along with photos and maps of places, ecosystems and the human condition that had seldom appeared to global visual audiences previously. Visual learning with photography and maps was on the rise. The interest and popularity in these topics generated more research on these topics as well as special television programs, global tourism, international NGOs with caring missions and United Nations efforts to improve human/environmental worlds. Maps were integral to many of these initiatives.

Those awakening efforts continued into the 1970s and 1980s with increased calls for a greater understanding of what was happening in many world regions as well as new topics and approaches to traditional topics [1, 6–11]. "Globalization" emerged as a term that replaced "international relations" in many academic, governmental and nongovernmental circles and discourses. Trade was no longer only a topic of interest between rich and poor nations. Health, gender variations, education and welfare programs were depicting concerns for human and humane conditions: massive rural-urban migration, rampant population growth in rural and urban areas and loans for a variety of human development initiatives. These were at the forefront of world regional and global planning. These topics began to be addressed in scholarly journals of the social sciences and what today we call the environmental sciences. Maps were being included in these presentations to show "what was happening where." The emergence of new states on the world political map, the appearance of new topics about human welfare and the beginning of environmental awareness were associated with an awakening of scholarly and policy worlds about topics that had long been silent.

5. From human to humane geography

While global awareness about the planet's environmental future was emerging, simultaneously there were calls for more attention about the planet's human family. The social sciences were concerned about population numbers and growth, gender inequality, economic livelihood in different sectors and nongovernmental organizations. These scholarly communities realized that greater detail included mapping topics about the human condition that were ignored. The actual "causes" for this greater interest in the human condition can likely be traced to several sources, one being the increased awareness in "visual earth" worlds from satellite imagery and greater global media coverage about "what is happening where" on the planet. This increased

visualization was occurring at the same time there was greater interest in many global worlds, especially in the "global rich" world and efforts to study and improve human/environment worlds. Already much of the world was experiencing some degree of social unrest about the "norm" in social values and political worlds. Protests, parades, legal challenges as well as race, gender and class divisions were fueling both mild and serious challenges to existing bureaucracies whether in the commercial, secular or political sectors.

Examples of these challenges were on full visual display for national, regional and global audiences around the world in television reporting, magazine content (more than words) and then on personal computer screens. They were transborder, international and cross-cultural accounts about "a visual planetary livelihood," not restricted mostly to the daily lives of those in the rich and developed worlds. The challenges for those in the geography and cartography communities were twofold: one, to learn more about their root causes and impacts; and two, to present and inform/educate public institutions and organizations about these social, political and environmental changes that were occurring almost "everywhere." Corporate, scholarly and political communities began to look seriously at issues about the causes of poverty, racial and gender discrimination, exploitation, crime, class warfare and welfare, health conditions, disease outbreaks, public spending on education and food distribution, environmental quality and justice, mental/cognitive maps and the many kinds of conflict (economic, religious, cultural) that were emerging and visible on the planet. It was not enough for social scientists to just explore and discuss these issues in a non-spatial context. All these issues exist in spaces, places and regions. The "where" feature needed to be examined not only as an issue but also to explore "why" or root causes. These challenges presented many "firsts" to those looking at the above topics, that is, to look beyond the concept or terminology to address mapping where these conditions and problems were occurring and to whom. Mapping was considered an integral part of addressing serious political, economic and social solutions and presenting humane solutions. These issues presented challenges for scholarly and policy communities in their own scholarly discipline, but also in informing a wider public. They were not just a concern for those in an Australian or Italian suburb or a port city in Southeast Asia or a coastal West Africa village, but everywhere on the planet. Human geography itself was changing not only in content, that is, what it studied, but how it presented and represented materials to global visual communities. Creativity was called for in presenting, informing and bettering the human and environmental worlds.

Accompanying these changes in the social and behavioral sciences were also changes between the sciences and the humanities. The worlds of those studying language, art, film, music and literature are often thought of as being separate and distinct fields different from those in the social and policy sciences. But they really are not completely separate scholarly fields of exploration and it is time to explore some common intersections between these two broad categories. There have been small, but increasing visible and influential, scholarly communities in the social sciences that are exploring some common grounds with those in the humanities and vice-versa. One example is the professional journal *Geohumanities.* Authors explore the intersections between music and culture, film and social conditions, language and the state, minorities in advertising, gender and city planning and architecture, diseases and environmental therapy, and landscapes of art and social/political protest. Many pioneering scholars in the social sciences see the visual and performing arts as ways to better understand the human condition. The same also applies to those in the arts,

film, and drama who observe many common linkages when it comes to looking at morality and the arts, the politics of caring, politics and museum displays, political protests and parades, censorship and politics, racial and gender discrimination in public education, television or internet policies, and politics as being a major influence in religion, sports and daily life. The recognition of overlapping spheres of interest and policy formation are stimulating some creative efforts by exploring some common grounds [12, 13].

Not to be eliminated from this discussion is how computers and computer technologies have changed not only the ways maps are made, but also the content of maps themselves. The very notion of having computer-designed maps radically changed the ways they were prepared and produced as well as their use in instruction, public policy, the corporate sector and for personal use. Creativity was and is much at work in the cartographic projections that were used, the designs themselves, the topics or themes mapped and their implementation for multiple purposes in the classroom, for scientific analysis and public policy and to prepare datasets on new topics. The technologies ushered in completely "new ways" of looking at "old topics" and "new ways" of exploring "new topics" at personal, community, national and global scales. The entire field of cartography in the 1980s and 1990s changed—the way maps were prepared, designed, reproduced and used [14–16]. Entire new subfields emerged including popular cartography, citizen cartography, critical cartography, medical cartography, behavioral cartography and digital mapping that brought new perspectives looking at traditional cultural, historical, political and environmental topics [17, 18]. Many of these innovations were considered radical as they included topics not considered previously. All fields and subfields of geography were affected by these innovations in designs, production and use. They include climate change and weather forecasting, natural disaster preparedness and impacts, electoral and redistricting geography, gender, race and justice issues, health care planning and the diffusion of diseases, children's and tourists' perceptions of landscapes, time/space logistics in human mobilities, language and religious diversity, and fluctuations in demographic change and ad hoc market economies. Complementing these emerging and creative cartographies of the earth's surface are maps using GIS systems, satellites and social media technologies. All continue to inspire new and different ways of not only studying a topic or a place but also mapping it [19–21]. The creators of these and other ongoing mapping innovations include a broad mix of interdisciplinary and international scholars who seek to know more about the importance of constructing, informing and educating both traditional and new map users.

6. Challenges in creativity and cartography

There are two realities in our thinking about geography and cartography intersections today. One is that we now have more than enough maps about every place and landscape so there is no reason for anymore. However, that geographic arrogance needs to be countered with some humility that tells us that we neither know much about some places nor we have maps of some important topics. Geographic knowledge depicted on maps, whether on traditional early twenty-first-century maps of places, landscapes and regions, is very uneven. If we consider the world's nearly 200 states, there are many more maps about some states and regions than others. The unevenness is in many cases reflected in a rich versus a poor world, with a few rich countries having many more maps than most poor countries. To fill or narrow these "gaps," we will

need new maps that portray existing and familiar features about countries and cities, such as economies, cultures, population growth, racial and gender inequities as well as transport arteries, tourism attractions, elections results and health care. The second reality is that something is happening to the "mapping worlds" today. A case might be made that with increased globalization, however that is defined in a transdisciplinary, cultural or political context, there is less need for maps. The argument continues that the names of places in the news about the world's economies or cultures or politics are becoming more familiar to the ear and where they are on a map is not important or necessary. Advocates of this position might argue that time is more important than distance, that is, how long it takes to contact or get to a place in person or by some machine technology is more important than if it is north or south of the equator or an interior or landlocked country. These same individuals support the thinking that in a "mapless" world one does not need a map to travel from X to Y. The GPS aficionado would declare that having such a device in a personal car or on a plane or your wrist is all you need to get from a point of origin to a destination. The travel time is important and direction and distance and what is "in between" are not. Paper and folded maps, which were once important, are considered almost antique documents for those traveling from Point A to Point B. Users of such maps care about what is "in between" points; their car dashboard map or social media map is more like a toy or gimmick than an instrument that evokes curiosity about a place or landscape feature. A cyber map is like a blank piece of paper with a few points connected.

For those who think that we know much, or too much, about the planet, they need more than a dose of humility to reflect on the unevenness of our planetary knowledge. This vast unevenness in knowledge and maps is reflected in places and subjects we know much about, places we know little or very little about, and places where we have almost no knowledge or maps. The terrae incognitae on the planet exists not only in polar and tropical worlds, but also in sparsely populated areas on all continents, including Antarctica. The map knowledge about places within the United States, France, Italy, and Japan is just as uneven as our map knowledge about Brazil, China, India, Indonesia, Nigeria, Mexico, Peru or the Democratic Republic of the Congo. The "silences" are rampant when it comes to mapping knowledge about major and minor cities, ethnic heritages, languages, religions, livelihoods, migrations and archeological finds. If we placed a grid of equal-sized cells over a world map and entered in each cell the amount of knowledge we have today, the result would be another map of vast unevenness not only on continents but also within countries and cities. That same map would also include squares over the world's oceans and seas where there is vast unevenness in place/environment knowledge. In short, the geographic knowledge about what is below the surface is next to nothing in most places. There is some knowledge about potential mineral deposits or valuable fishing grounds or territorial sea conflict or major transport routes or origins of violent weather, but there are many places and regions with few or any maps of what is below the surface. The aquae incognitae are one of the major regions or places on the map that beg for more place knowledge about subsurface landforms, migrating fish, buried mineral deposits, environmental pollution levels, potential tourism sites and perhaps even human habitation.

A cursory examination of present-day maps and map knowledge about places and environments has many striking similarities to those earliest human sketches on cave walls, rocks, wood and clay. They were using both their knowledge and their imaginations to depict "what was where." Those creative-guiding impulses led them to prepare graphical and cartographical messages for their own knowledge and use and also

for succeeding generations. Cartographers today using twenty-first-century cameras and satellites, whether women or men, amateurs or professionals, display some of the same artistic skills and curiosity levels as the ancient cartographers to map and remap familiar and unfamiliar places on Planet Earth and beyond.

7. Creative mapping is alive and well

Maps are essential efforts that aid our understanding about the importance of places, landscapes, regions, spaces, networks, surfaces and boundaries in many disciplines and fields of study. They are not, nor should they be considered, only the interest and concern of geographers or cartographers. Rather "umbrella" views of these concepts include displaying or picturing them graphically in some ways to those in many fields. Even a "surface" or casual thinking about earth places, spaces, surfaces, landscapes and boundaries will acknowledge that these are, or can be, a focus of those studying biology, geology, astronomy, architecture, health care, law, religion, languages and economies. Some study the earth's surface and features, others below the surface and others what is above the earth's surface. All these, to one degree or another, can use these geographical concepts and perspectives to explore the place or an environment concept in studying colonial, military or economic history, human rights and welfare, environmental issues and topics in biology, psychology, geology, society, politics, oceanography, astronomy and other fields. Maps in one way or other represent an important perspective or way to look at human relations and environments at all scales and between the social, natural and physical sciences and the sciences and humanities. Too often geographers may think that maps are the "singular" domain of those in geography. That is a rather narrow way of looking at the worlds around us, as places, locations, networks, surfaces and landscapes are all at the heart of studying many topics in many disciplines.

Recognizing the stark reality that there are thousands and millions of maps that can be constructed and hundreds of atlases that might be compiled at local and universe levels, we focus the discussion now on earth-maps that are familiar to many in an everyday world. This is the scale that geographers study and prepare maps, that is, places where people live and have lived, work, play, worship and interact. Other disciplines use spatial perspectives at other scales, including microbiology, geology, meteorology, oceanography, archaeology, law, physics and astronomy, all of which study and map many of the same concepts geographers use in seeking better visual knowledge levels to understand above and below the earth's surface.

In the following paragraphs, I present and discuss some examples of innovative maps that will help us better understand the earth's inhabitants and environments. In each example, a salient point is that "there is much more we do not know about a place or landscape or region than we do know." In the contemporary high-tech world using huge databases, unimaginable even three decades ago, there are ongoing efforts to examine the nature of these databases and to map distinguishing features about a place or a region or a landscape. Many advanced technologies use GIS or Geographic Information Systems. These utilize massive databases looking at weather and climate, disaster preparedness and impacts, global warming, land-use changes, population shifts, human welfare (rich and poor) gaps, elections, shifts in cultural, and political and religious preferences. Many innovative computer programs were written to map key features of some human or environmental feature or event. The collection and availability of these interdisciplinary and international databases have stimulated

geographers to explore the existing status of some phenomenon or a set of related phenomena at local, city, national and international scales. GIS techniques and models today are used in a wide variety of fields and disciplines seeking both to visually present the existence and appearance of some feature or using those maps and related graphics to consider new ways to understand interrelated, or previously considered unrelated, phenomena.

Another computer-driven innovation in the past several decades has been the emergence of search engines which provide massive datasets that can be used for popular use or scholarly research. Yahoo and Google were pioneers in these explorations; Amazon, Wikipedia, Facebook, Twitter and YouTube are also rich sources of information. The Google enterprises include massive generic databases about many topics and themes as well as data about regions, countries and cities. A second database called Google Scholar includes citations for articles, chapters, books and other materials, including maps, that appear in scholarly literature bases. Two additional valuable features of the Google databases are that the entries or hyperlinks are available in languages other than English and that the hyperlinks are ranked according to some industry-defined formula. That ranking is neither based on the most recent year an item was published, nor the number of citations, but probably some combination about the ranking of the journal. For example, one can examine the top 10 or 50 entries in the Google Scholar database to identify major recent research findings on a topic. In Google searches, one enters, for example, the name of a country and feature, such as, Baltic States + climate change; South Africa + COVID 19 vaccination rate; China + minorities, or the Mediterranean Sea + maps of water pollution. Entering these terms in the Google Search box will yield the number of hyperlinks available. The number of hyperlinks, as well as the rankings, constantly change and will vary depending on the language used in the search. The Google search engines provide the inquisitive scholar with contemporary and historical source materials and are the most important sources scholars use. In this context, they are more valuable than using current materials in college, university or national library collections or looking at the contents of a few major journals.

In undertaking this research using Google Scholar entries, I had little idea what would emerge from collecting the data as well as how best to map the results [22, 23]. The maps, as is noted below, contain some patterns and features that were unexpected. They clearly demonstrate that the knowledge base of a topic or of countries or cities is very uneven and that those differences raise questions about the best way to map the results for research either about a single topic such as Pacific Islands + missionaries or a region such as South America or North Africa.

The database was used to examine "how much do we know about a given country." The raw Scholar hyperlink data are from an English language search conducted in late November 2021 where the name of the country was entered into the Google Scholar search box. There were vast differences, as one would expect, from those states at the very top and those at the very bottom. **Figure 2** is compiled from these data. The Tokyo metro area has a population (39 million) almost equal to that of Canada, Poland or Afghanistan or the combined populations of Kazakhstan and Zambia or Syria and Guatemala.

Another perspective is gained by examining maps showing the vast differences in the absolute number of Scholar hyperlinks for the 198 countries. The countries with the most Scholar hyperlinks were the United States (6 million), Switzerland (5.8 million) and India (5.7 million) and the fewest were Eritrea, St. Vincent and Grenadines, Bahrain and Tuvalu, each with less than 75,000 hyperlinks. Because of the vast

Figure 2.
Maps of comparable population. Each area has about 39 million residents, which is about the same as the total population of the following 53 countries combined (listed from smallest to largest population): Vatican, Nauru, Tuvalu, Palau, San Marino, Monaco, St. Kitts & Nevis, Marshall Islands, Cayman Islands, Andorra, Antigua & Barbados, Seychelles, Tonga, St. Vincent & Grenadines, Grenada, Micronesia, Kiribati, St. Lucia, Samoa, Sao Tome & Principe, Barbados, Vanuatu, Iceland, Bahamas, Belize, Brunei, Malta, Cape Verde, Suriname, Western Sahara, Montenegro, Luxembourg, Solomon Islands, Bhutan, Guyana, Comoros Islands, Fiji, Dijbouti, Eswatini, Cyprus, East Timor, Mauritius, Equatorial Guinea, Estonia, Trinidad & Tobago, Bahrain, Latvia, Guinea-Bissau, Slovenia, North Macedonia, Lesotho, Botswana and Gambia.

differences, the data were ranked into quintiles (**Figure 3**): 1–39 (the most), 40–79, 80–119, 120–159 and 160–198 (the fewest hyperlinks). A similar procedure was used when examining the number of maps about each country in the Scholar database. The United States (4.3 million) had the most followed by the People's Republic of China (3.5 million), Germany (3.5 million), France (3.4 million) and Japan (3.2 million). At the other end of the spectrum these countries had fewer than 10,000 Scholar hyperlinks each: Ukraine, Nauru, Micronesia, Belarus, Bahrain, Tuvalu and St. Kitts. The bottom map also shows the vast unevenness in the number of maps in the database.

Figure 4 shows the vast differences in the number of hyperlinks among the world's capitals. In most countries, the capital city is the largest city, has the most hyperlinks and is most important culturally, commercially and politically. Exceptions are New York City (vs Washington, DC), Toronto (vs Ottawa, Canada), Sydney (vs Canberra, Australia), Cape Town (vs Pretoria, South Africa), Lagos (vs Abuja, Nigeria), Mumbai (vs New Delhi, India), Auckland (vs Wellington, New Zealand), Jerusalem (vs Tel Aviv, Israel) and Istanbul (vs Ankara, Turkey). The data were gathered by entering (in English) the name of the capital city and the country into a Google search (such as, Paris, France; Lima, Peru; Port Moresby, Papua New Guinea; Bratislava, Slovakia). There are very significant differences between those cities in Zone 1
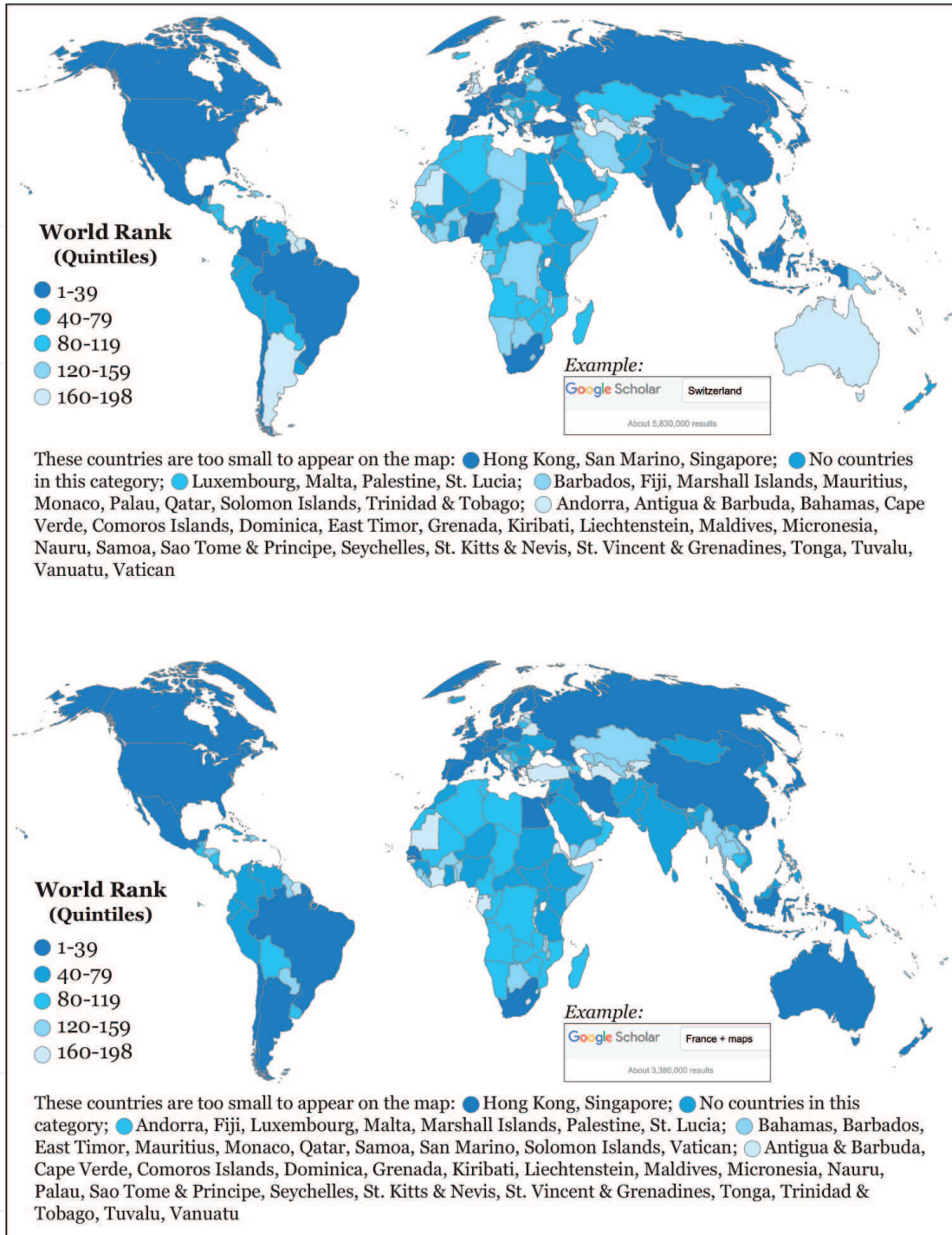
Figure 3.
The knowledge base of countries (top) and country maps (bottom) according to number of Google Scholar hyperlinks.

(the most hyperlinks) and Zone 6 (the least). Regional differences again are stark, with much more knowledge in the database for European than for African (orange type) and some Asian (black type) countries. Examples of capitals with less than 50,000 hyperlinks were: Monrovia, Liberia; Minsk, Belarus; Vatican City and Libreville, Gabon. The pie graph clearly shows that six cities in Zone 1 have one-quarter of the hyperlinks of all world capitals.

The data also revealed vast differences in the number of maps about capital cities. Some capital cities have many maps and others very few. Paris, London and Berlin have over 1 million map hyperlinks; Cairo, Egypt and Ankara, Turkey somewhere in
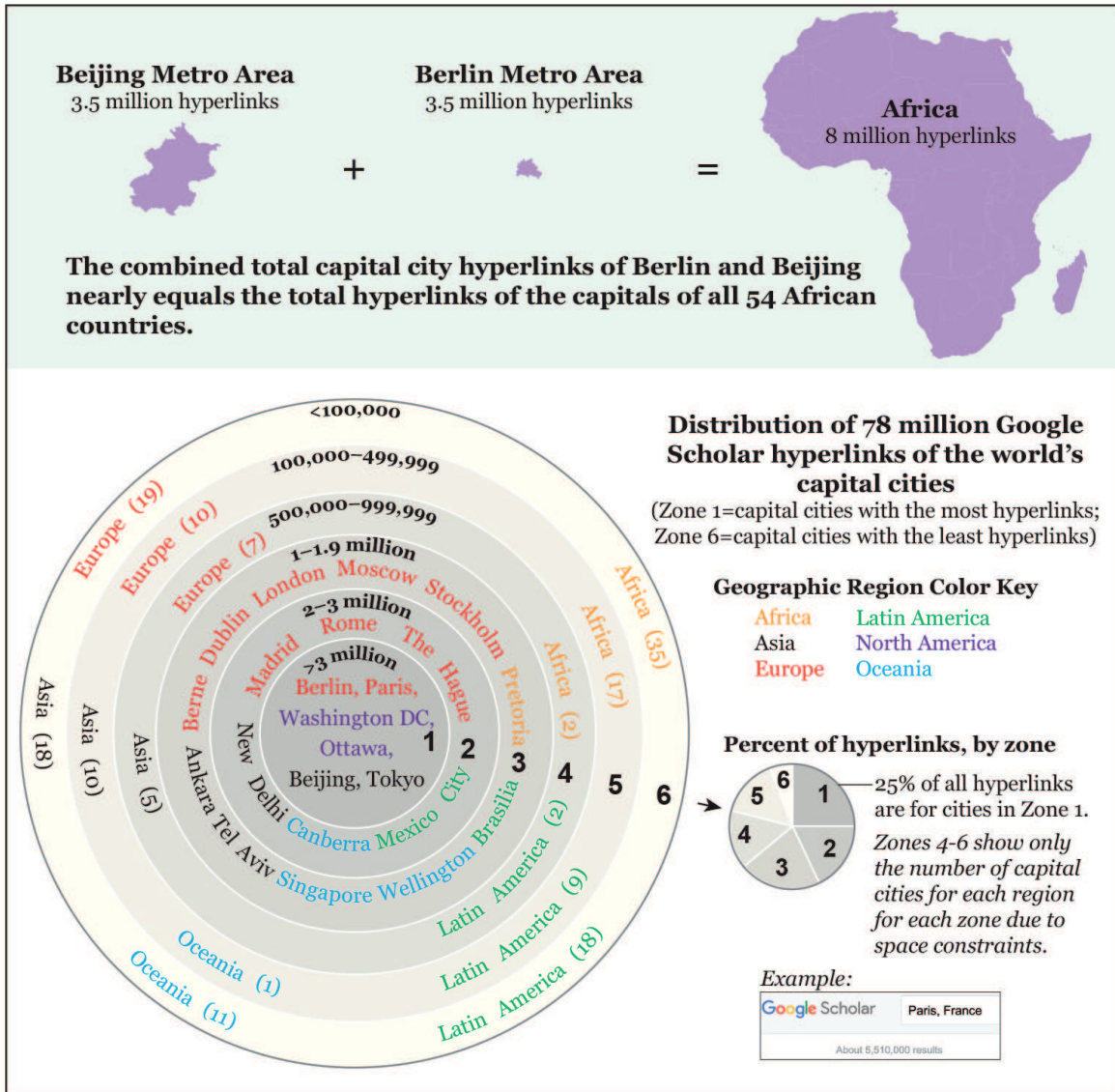
Figure 4.
The number of Google Scholar hyperlinks shows a large variation in available information about the capital cities of 198 countries.

the middle (99,000 and 62,000 respectively) and Monrovia, Liberia; Georgetown, Guyana; and Asmara, Eritrea had fewer than 10,000 each. The top of the figure shows that the combined Scholar hyperlinks of Beijing and Berlin approximate those of all 54 African capitals combined.

The third set of maps explores the vast differences in the amount of information about major water features, specifically oceans, seas, rivers, bays and straits (**Figures 5** and **6**). There are some major "knowledge gaps" in the scholarly literature about these features. For some seas and rivers, there were many studies, for others very few. Compare the North Sea and Persian Gulf (#1 and #20 on **Figure 5**) or the Congo and Mekong Rivers (#9 and #12 on **Figure 6**). A strong case that can be made from looking at global and regional patterns is that we are truly witnessing aquae incognitae. Additional research could be undertaken at below surface physical features, climate change patterns and natural disasters, fishing and mining economies, and coastal and island tourist destinations.

"Explorations into the unknown or little known" are extended to the eight world maps in **Figure 7**. Each world map is empty except for ??? which indicates that it
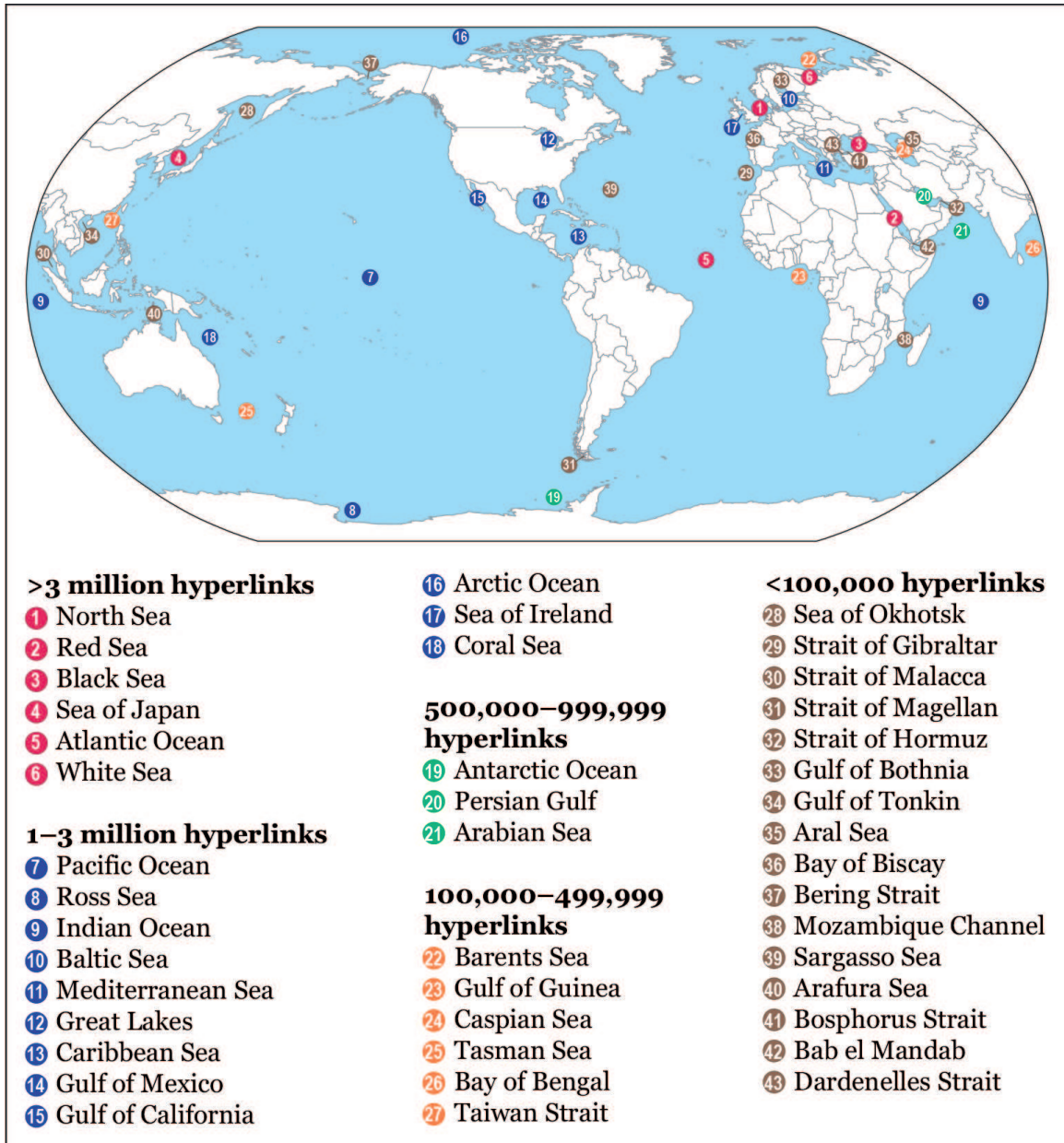
Figure 5.
Knowledge base of planetary water features.

would be useful to study the topic in the title. These include developing a database to explore social media networks, users and content; in what countries and especially what world regions scholars are studying global warming; what countries are the leaders and laggards in LGBT issues about rights, discrimination and empowerment; what networks of successful programs are addressing seasonal as well as deep poverty and illiteracy in Africa, Asia, Latin America and what role the UN, EU and faith communities are playing in these efforts; where the most successful national sustainability projects are when it comes to green energy projects, promoting biodiversity and innovative conservation and agricultural practices to reduce global warming; and what steps are most successful in preparing for natural disasters and reducing human and environmental impacts. These representative maps are meant to stimulate scholars in the social and natural sciences and the humanities to explore pioneering research in rural and urban areas in their own countries and major world regions.
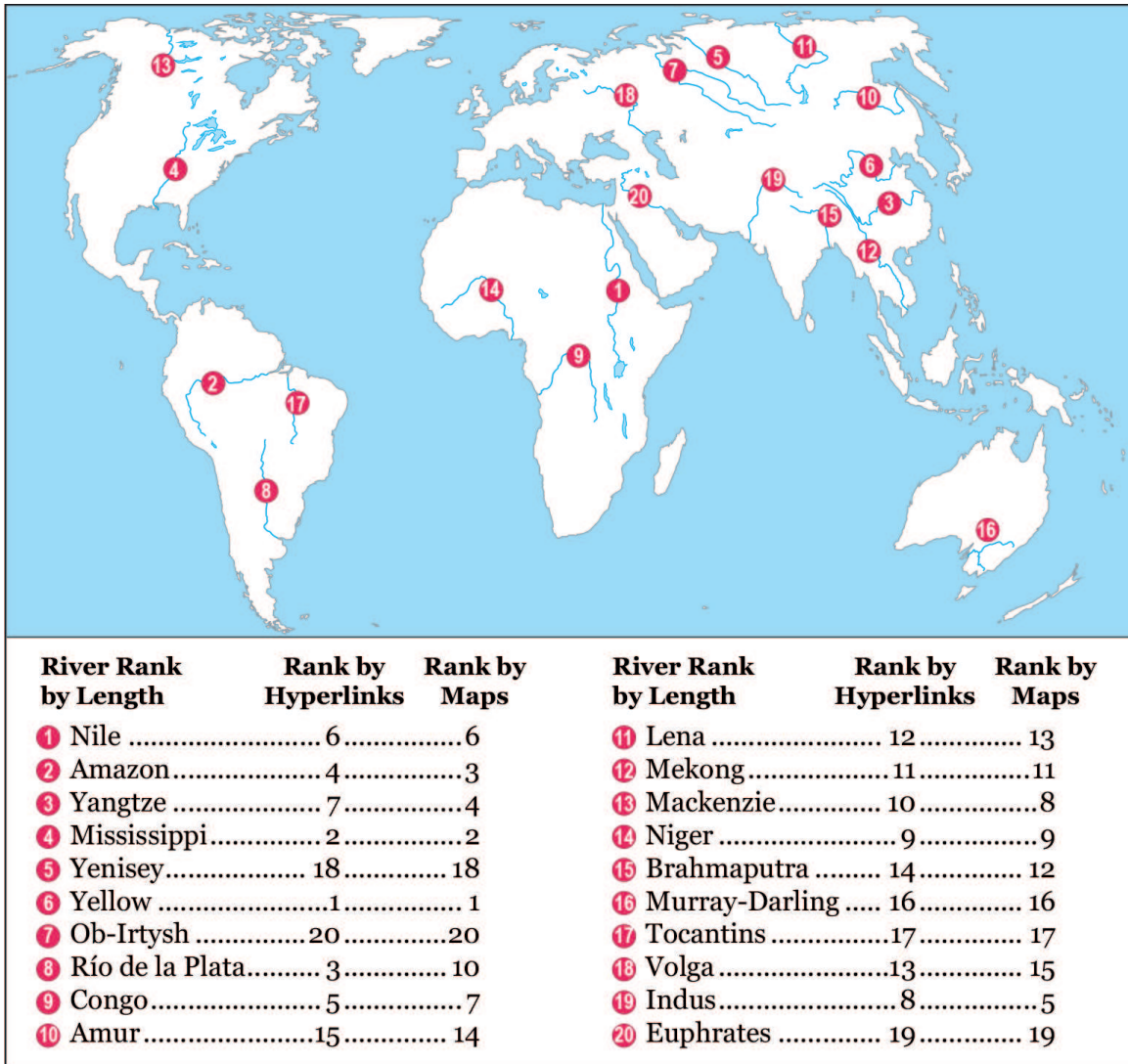
Figure 6.
Knowledge base of the 20 longest rivers.

The final map is a "blank" map (**Figure 8**). It is meant to stimulate the reader to consider tackling a topic important at any scale. The map could be a village, a city neighborhood, a large or small city, a coastal or inland tourist destination, a political capital or a university city, a country or group of countries, a region of a continent or a continent. It could also be related to features about humans including migration routes, children's and women's rights, networks and patterns of those barely surviving, border crossing points, crime rates, health/disease conditions, unemployment rates, etc. In an environmental context, it could be placed annually experiencing tsunamis or hurricanes or occasional earthquakes or a river basin, an ecozone or storm track region. All of these places and landscapes have features that could be mapped but seldom are. The list of sites could be expanded to include places of spouse, child and elderly abuse, child labor, human trafficking routes, historical and contemporary slavery networks, dispersal or clusters of undocumented refugees, white collar criminals, adults unvaccinated against COVID-19, community quilting projects, unregistered voters, foreign investments and ownership of countries and cities, geographical references in religious and secular music, variations in the books ordered for local libraries in a large city versus small city, elderly populations not covered by medical programs, geographical roots (home towns) of those in diplomatic corps and
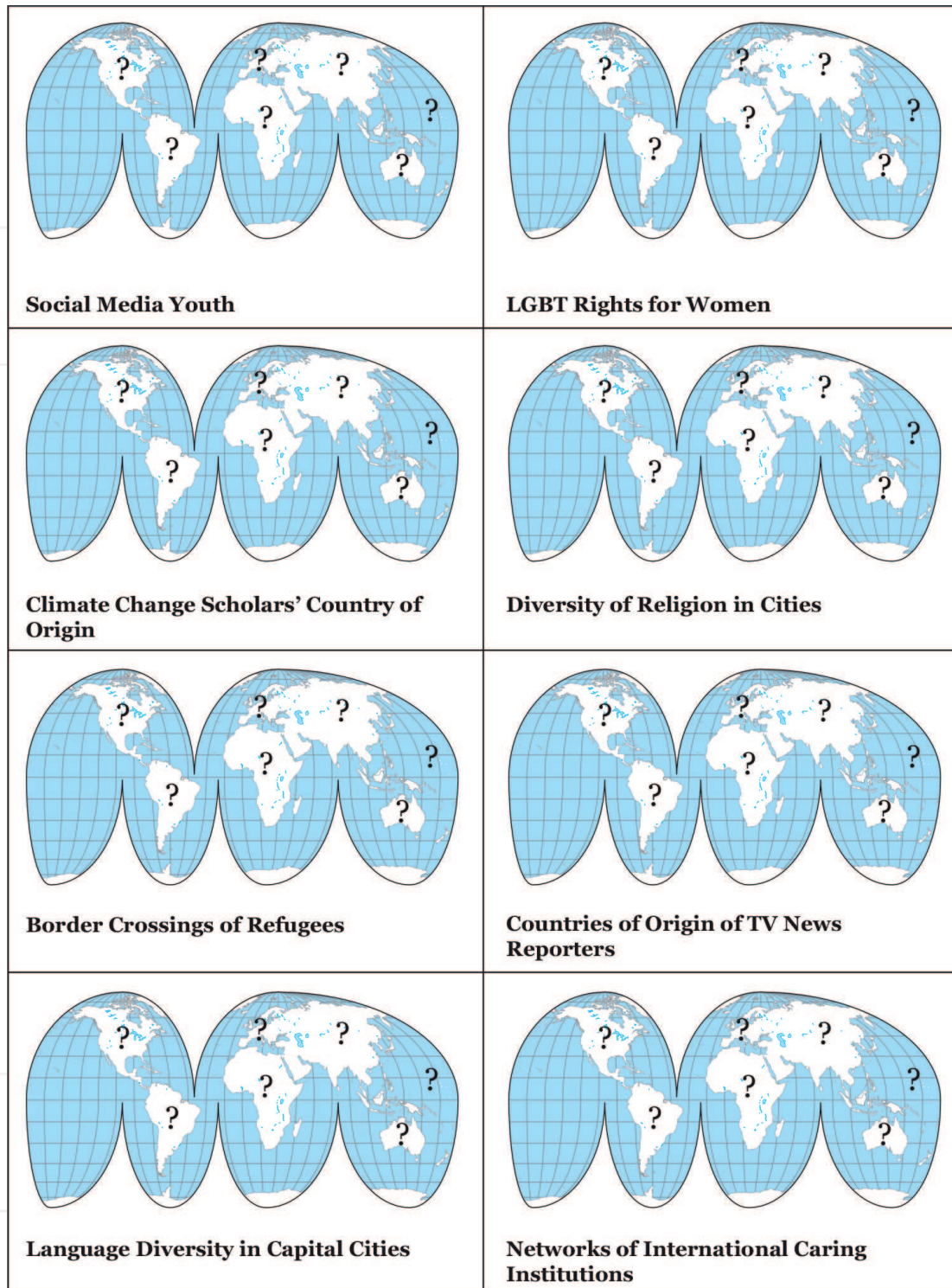
Figure 7.
Exploration into cartographies of the unknown.

faith communities, the densities of foreign language translators and services, social class neighborhoods, time-space patterns of the disabled, news from little known places (Africa, rural areas in the Global South), underemployed, college dropouts, networks of volunteers and criminals, the daily travels of mobile health workers and volunteer lawyers for indigenous peoples, devolution patterns in global tourism due to COVID-19, fashion industry and sports communities' responses to COVID-19, song lyrics in COVID-19 music, mapping morality in COVID-19 times, immobility during COVID-19 times, changes in bird migrations with climate change, and many more
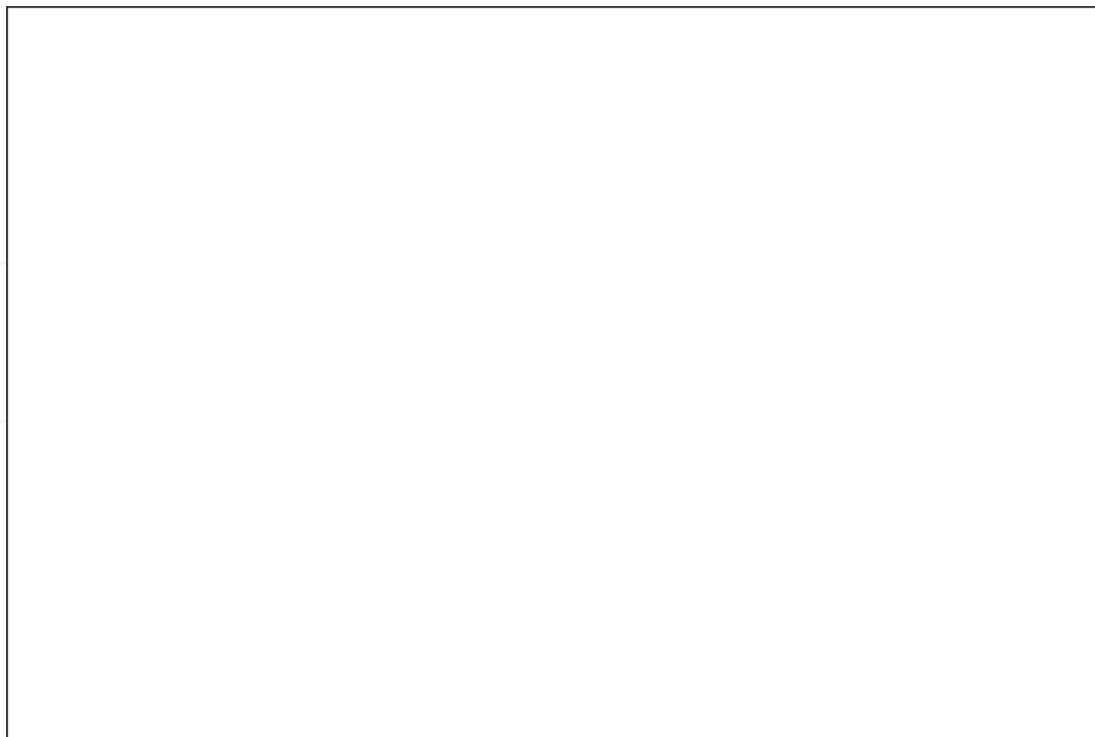
Figure 8.
Invisible, silent and unknown geographies.

topics. The world is literally full of unexplored silent and invisible spaces awaiting the attention of geographers at all scales.

8. Going forward with inspiration

Humans throughout history and across continents have always been inspired to communicate with others in various ways. These inspirations have come from words and phrases in narratives and music and individual and community efforts bringing empowerment and human progress. Expressions about emotions, togetherness, heritage and communication have also come through "the visual." These can be in sketches, drawings, paintings, monuments and photographs. Maps are part of this visual repertoire as they are human constructions that reflect the efforts, insights, expectations and imaginations of the creator, whether that be an individual depicting some topic or pattern in some original way with the use of colors and designs or an innovative computer programmer empowering the elderly with disabilities or a group effort tackling some controversial environmental problem. What is paramount in promoting ongoing creative mapping as well as mapping creativity is incorporating both a "longitude and latitude thinking" about places, locations, surfaces, networks, boundaries and environments. These efforts emerge when thinking about the subject matter outside the traditional "boxes" or "frameworks" of geographic thought and human experience. These include exploring the perspectives that come from exploring art, music, drama, and words as much as networks, communities, big data sets, bridges and systems. Throughout human history, both amateur and professional cartographers have displayed creative talents in mapping what they see, experience and value around them. From the earliest cartographers using sticks and stones to present-day digital, social media and satellites, the interest, appeal and use of maps

continue to inform, value and display the creative worlds surrounding everyone and every place local, planetary and universal. In these efforts, there are no ends.

Acknowledgements

Author details

Stanley D. Brunn
University of Kentucky, Lexington, Kentucky, USA

*Address all correspondence to: brunn@uky.edu

IntechOpen

References

[1] Brunn SD. Geography and Politics in America. New York: Harper and Row; 1974. p. 443

[2] Boorstin DJ. Discoverers: A History of Man's Search to Know His World and Himself. New York: Random House; 1983. p. 745

[3] Harley JB. The New Nature of Maps: Essays in the History of Cartography. Baltimore: Johns Hopkins Press; 2002. p. 352

[4] Monmonier M. Cartography in the Twentieth Century. Chicago: University of Chicago Press; 2015

[5] Monmonier M. How To Lie with Maps. Chicago: University of Chicago Press; 2018

[6] Adams RF, Adams JS, Gould P. Spatial Organization: The Geographer's View of the World. Englewood Cliffs, NJ: Prentice-Hall; 1971. 587 p

[7] Haggett P. Locational Analysis in Human Geography. London: Edward Arnold; 1965. p. 339

[8] Harvey D. Explanation in Geography. London: Edward Arnold; 1969. 521 p

[9] Relph E. Place and Placelessness. London: Pion; 1976

[10] Seager J. The Women's Atlas. New York: Penguin; 2018

[11] Tuan Y-F. Space and Place. Minneapolis: University of Minnesota Press; 1977

[12] Brunn SD. Mapping morality: Visible and the invisible geographies. Journal of the Bulgarian Geographical Society. 2021;**44**:7-14. DOI: 10.3897/jbgs.e64223

[13] Brunn SD, Dodge M, editors. Mapping Across Academia. Dordrecht, the Netherlands: Springer; 2017. 394 p

[14] Goodchild MF. Geographic information systems and science: Today and tomorrow. Procedia Earth and Planetary Science. 2009;**1**:1037-1043. DOI: 10.1016/j.proeps.2009.09.160

[15] Harvey F. A Primer of GIS: Fundamental Geographic and Cartographic Concepts. New York: Guilford; 2015

[16] Hsu M-L. The role of projections in modern map design. Cartographica. 1981;**18**:151-186. DOI: 10.3138/9821-M648-7189-0088

[17] Pickles J. The Map Reader: Theories of Mapping Practices and Prospects. Englewood Cliffs, NJ: Prentice-Hall; 2011

[18] Pickles J. A History of Spaces: Cartographic Reason, Mapping and the Geo-Coded World. New York: Routledge; 2012

[19] Brunn SD, Wilson MM. Cape Town's million plus black township of Khayelitsha: Terrae incognitae and the geographies and cartographies of silence. Habitat International. 2012;**30**:1-11. DOI: 10.1016/j.habitatint.2012.10.017

[20] Brunn SD, Paradiso M. Digital divides in mountain regions: Global and local knowledge and silences. In: Kingsolver A, Balasundaram S, editors. Comparative Mountain Regions. Bloomington, IN: Indiana University Press; 2018. pp. 306-341

[21] Devriendt L, Boulton A, Brunn SD, Derudder B, Witlox F. Searching for Cyberspace: The position of major

cities in the information age. Journal of Urban Technology. 2011;**18**:73-92. DOI: 10.1080/10630732.2011.578410

[22] Demographia. World Urban Areas. 2021. Available from: demographia. com/db-worldua.pdf [Accessed: 15 November]

[23] Google Search Engine. 2021. Available from: Google.com. [Accessed: 15-20 November]