

Cartography 2

Approaches in Map

Design and

Interpretation

As of 20 May 2015
Presented by David Jonathan C. Garcia, EnP
Urban Planner and Field Coordinator

OUTLINE

art and science

communicative/behavioral approach

side: projections

critical approaches

MAPPING

AS ART AND SCIENCE

MAPPING AS ART AND SCIENCE

Maps are considered as works both of art and of science. Art in maps is reflected in aesthetics and visual pleasures derived when looking and using maps. Science in maps is embedded in communication and standardization of symbols when planning and making maps. Some maps are more artistic. Other maps are more scientific. One shall know if a map is more or less artistic/scientific by knowing indicators on the next slide.

ART AND SCIENCE OF MAPS
BY JEREMY CRAMPTON

ART

CREATIVITY

SUBJECTIVITY

INTUITIVE-HOLISTIC
APPROACH

EMOTIONAL INPUT
AND RESPONSE

ASSESSMENT OF
QUALITY BASED ON
AESTHETICS

SCIENCE

REPEATABILITY

OBJECTIVITY

STANDARDIZED-
TECHNICAL APPROACH

FUNCTIONALITY

ASSESSMENT OF TEST
PRACTICES ESTABLISHED
THROUGH EMPIRICAL
TESTING



<http://laughingsquid.com/wp-content/uploads/8-bit-google-maps-1.jpg>





<http://www.essentialvermeer.com/catalogue/geographer.html>



In Ven. M. C. C.
MDCLXXVIII

ART AND DESIGN
ARE CENTRAL TO CARTOGRAPHY.

MAPPING

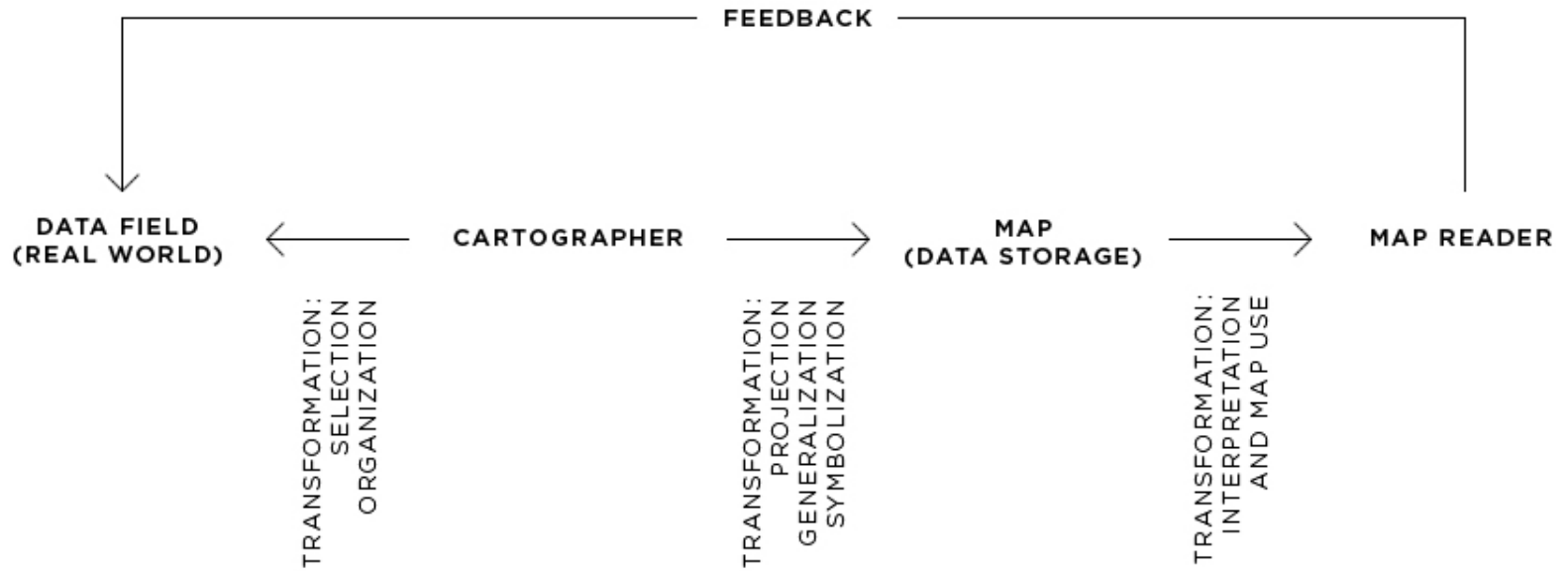
AS COMMUNICATION

COMMUNICATIVE/BEHAVIORAL APPROACH

Maps eventually became influenced by empiricism and positivism. In the latter half of the 20th century, there were efforts to establish standards for symbols in maps that more people of different backgrounds may use maps easily and interchangeably. Responses to visual stimuli in maps were studied and noted. The results of such studies on visual stimuli guided cartographers in choosing which symbols are easily understandable.

In this model for making and assessing maps, the map is thought of as a data storage entity and the purpose of the cartographer is to design the map in such a way that the map conveys the intended information. In this model the cartographer is the sender and the map is the messenger.

CARTOGRAPHY AS COMMUNICATION SCIENCE (ADAPTED)
BY DENT IN GOMEZ AND JONES III



SIDE: PROJECTION AND GRATICULES

Because there is a need for transforming the curved Earth's surface onto a flat one, projections are needed. These projections inevitably create distortions of one or more of these attributes: size, area, shape, distance, and direction. The attributes that are preserved and sacrificed depends on the purpose of the projection.

An equal-distance projection is for pilots and captains of ships. A projection that preserves direction is important for navigators, too. An equal-area projection is fit for the job of a real estate broker. Henceforth, there is no perfect projection only one that is best suited for a purpose.

projection

is a systematic rendering on a flat surface of the geographical coordinates of the features found on Earth's surface (Knox, Marston, and Nash).

equidistant projections	allow distance to be represented as accurately as possible.
conformal projections	map projections on which compass bearings are rendered accurately.
azimuthal projections	map projections on which compass directions are correct from only one central point
equal-area (Knox, Marston, and Nash)	map projections that portray areas on Earth's surface in their true proportions

A projection preserves and ignores the accuracy of one or more of these: size, shape, area, direction, and distance.

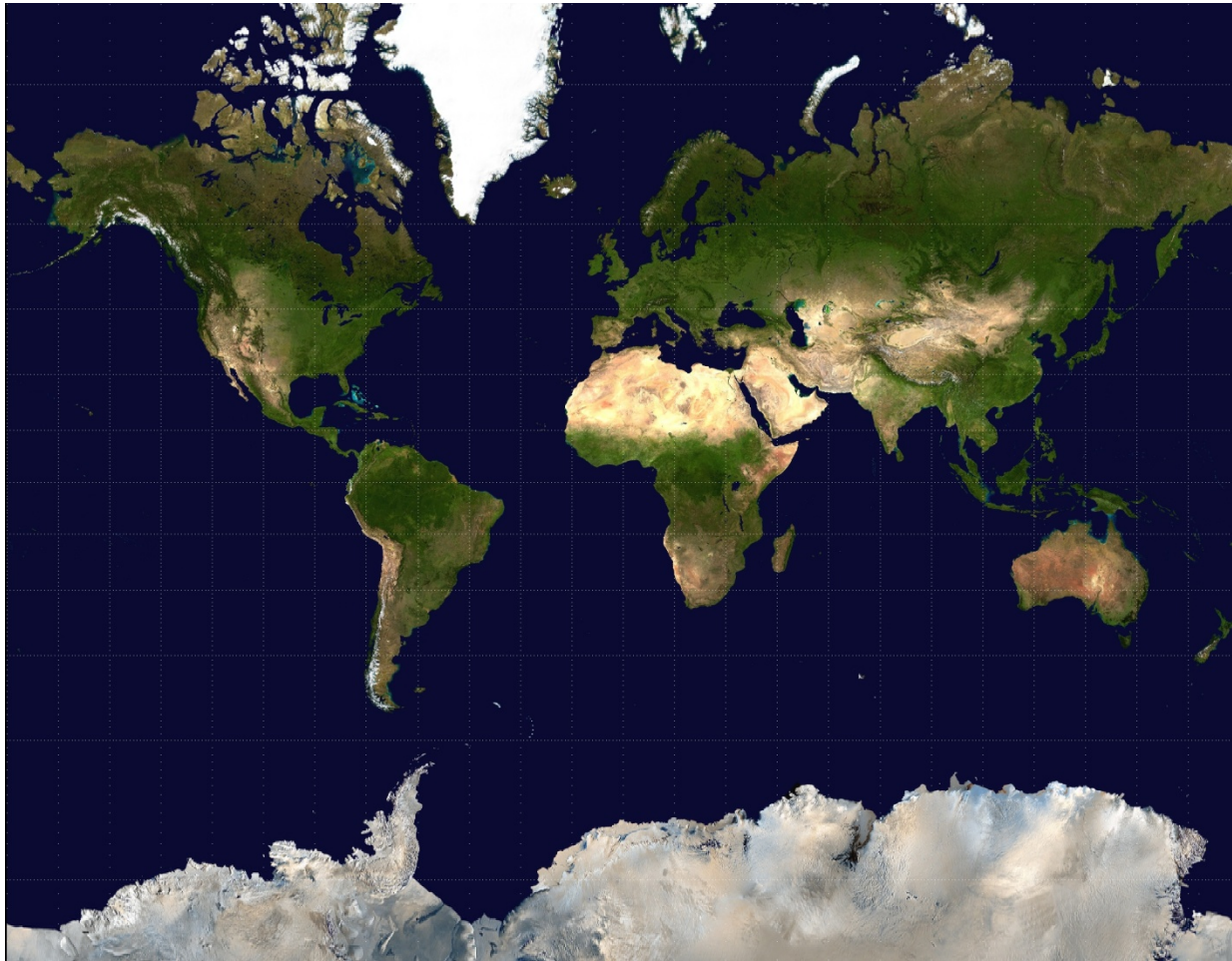
graticule

a regular grid, used for referencing points on a map (Mayhew).

equidistant: polyconic



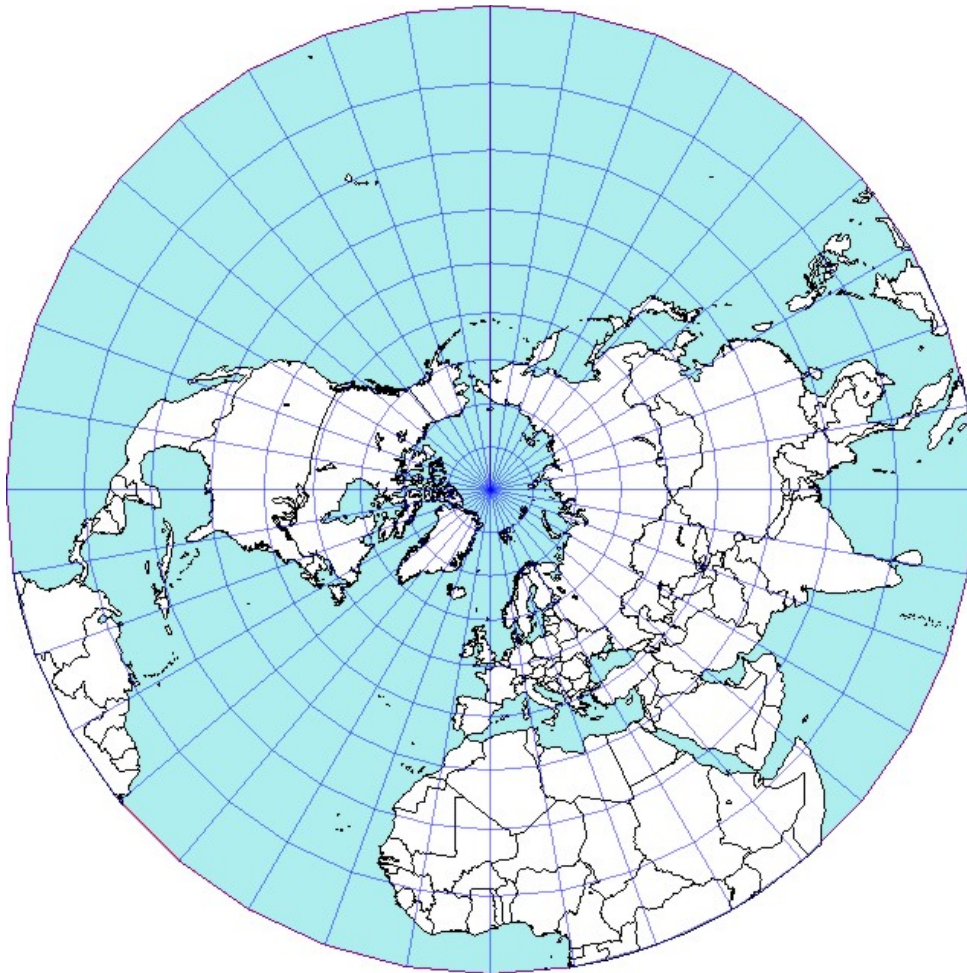
conformal: mercator



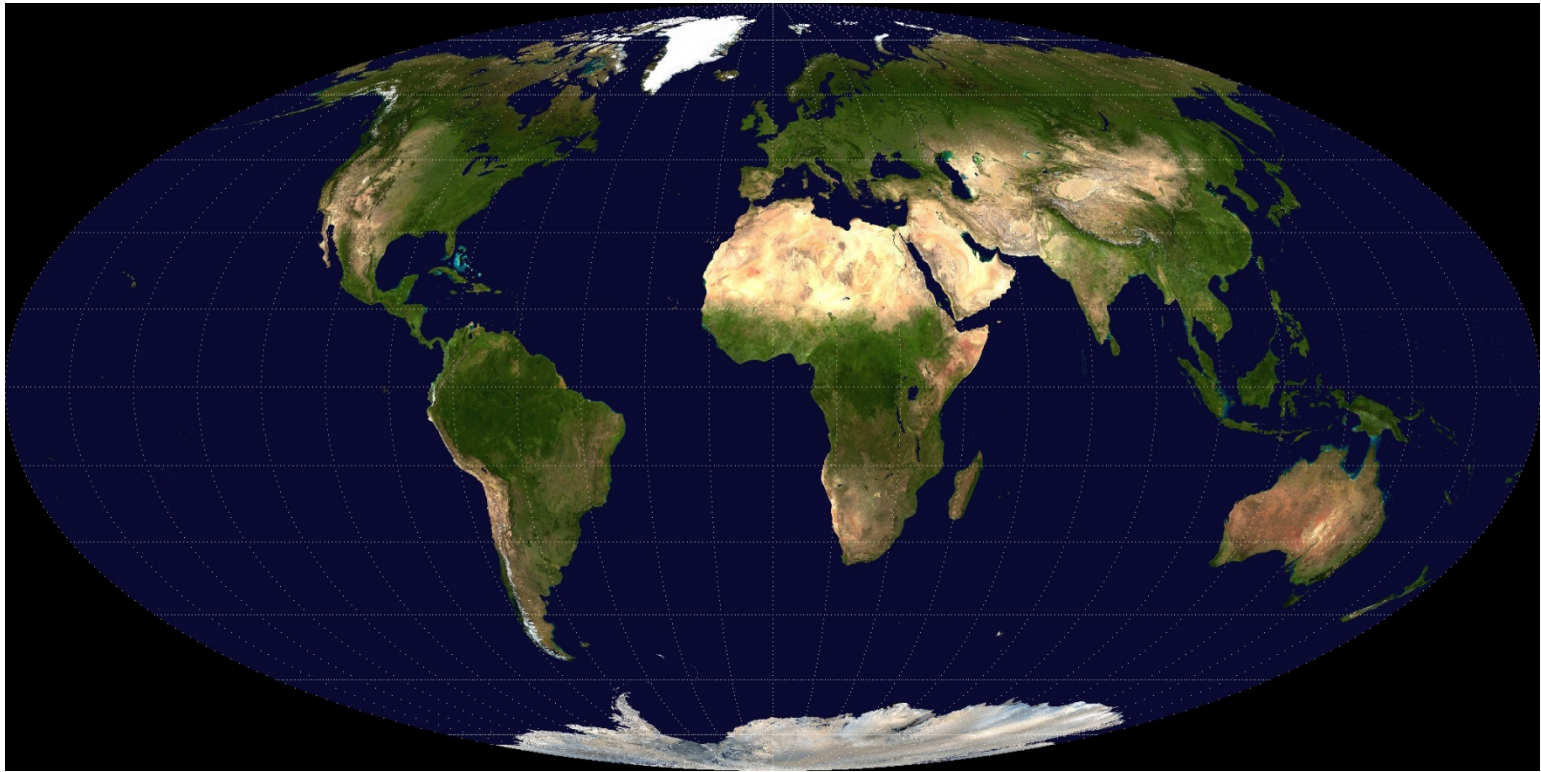
azimuthal: lambert



azimuthal



equal area: mollweide



compromise projection: dymaxion



how a Dymaxion map is made



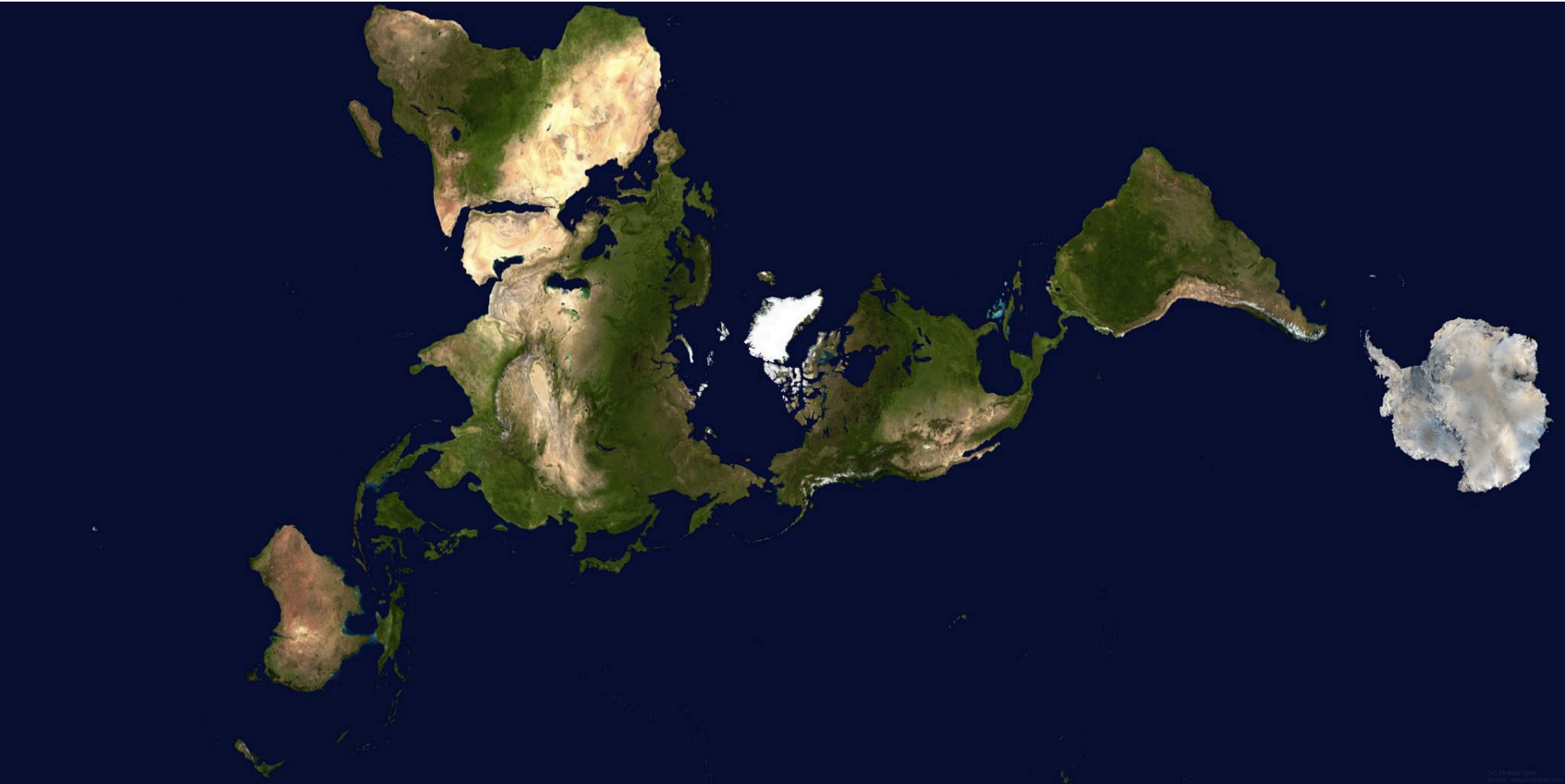
en.wikipedia.org/wiki/Dymaxion_map

A black and white portrait of Buckminster Fuller. He is an older man with short, light-colored hair, wearing thick-rimmed glasses, a dark suit jacket, a white shirt, and a dark tie. He has a thoughtful expression, with his right hand resting against his chin. The background is dark and features faint, geometric patterns and a large, light-colored, abstract shape on the right side.

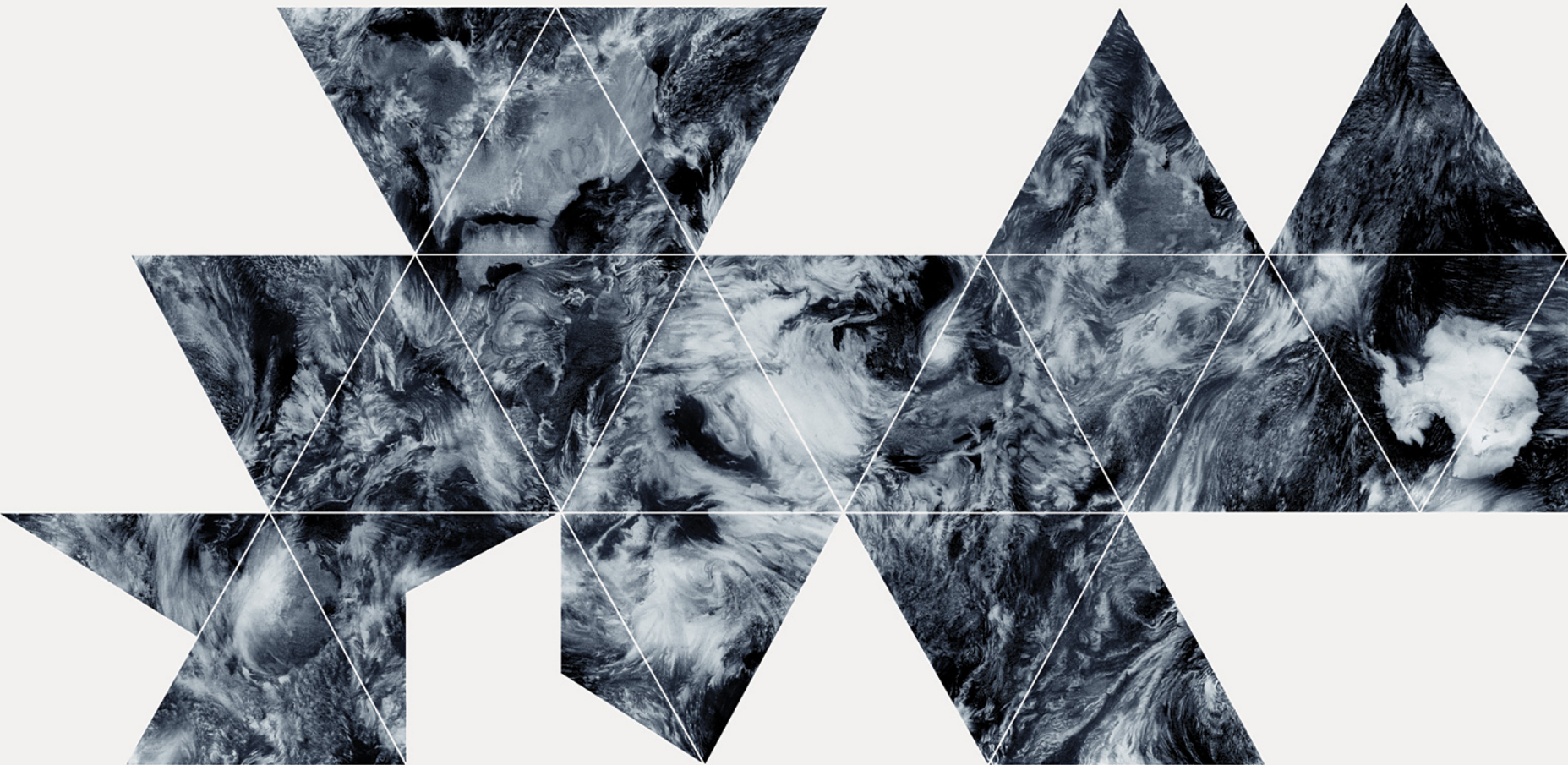
**BUCKMINSTER
FULLER**

(1895-1983)

When I am working on a problem, I never think about beauty but when I have finished, if the solution is not beautiful, I know it is wrong.



<http://telemachusunedited.files.wordpress.com/2011/03/lowpp.jpg>



CLOUDS ON FULLER PROJECTION
AIR-OCEAN WORLD DYNAMION MAP
pencil drawing after satellite images.

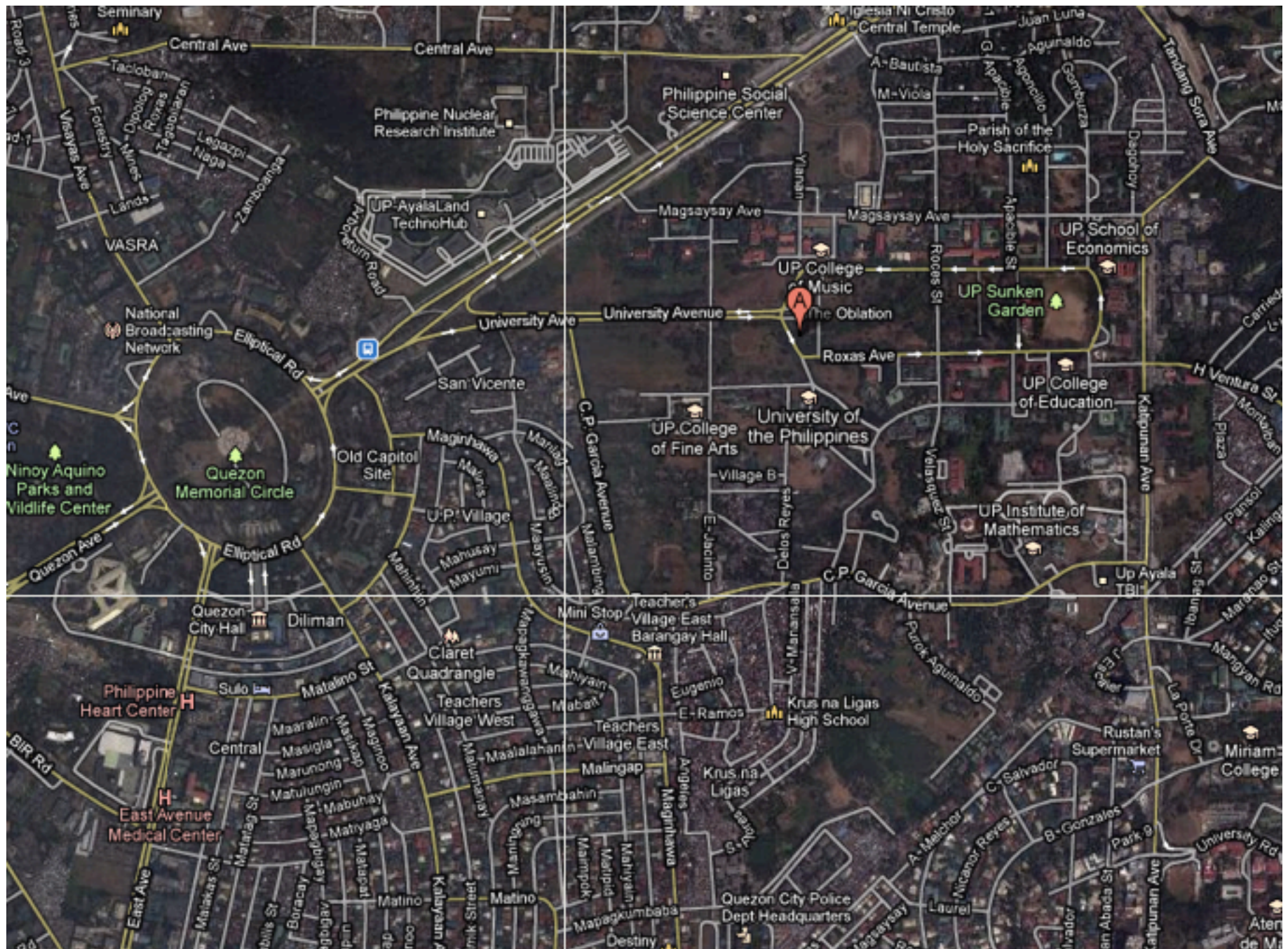


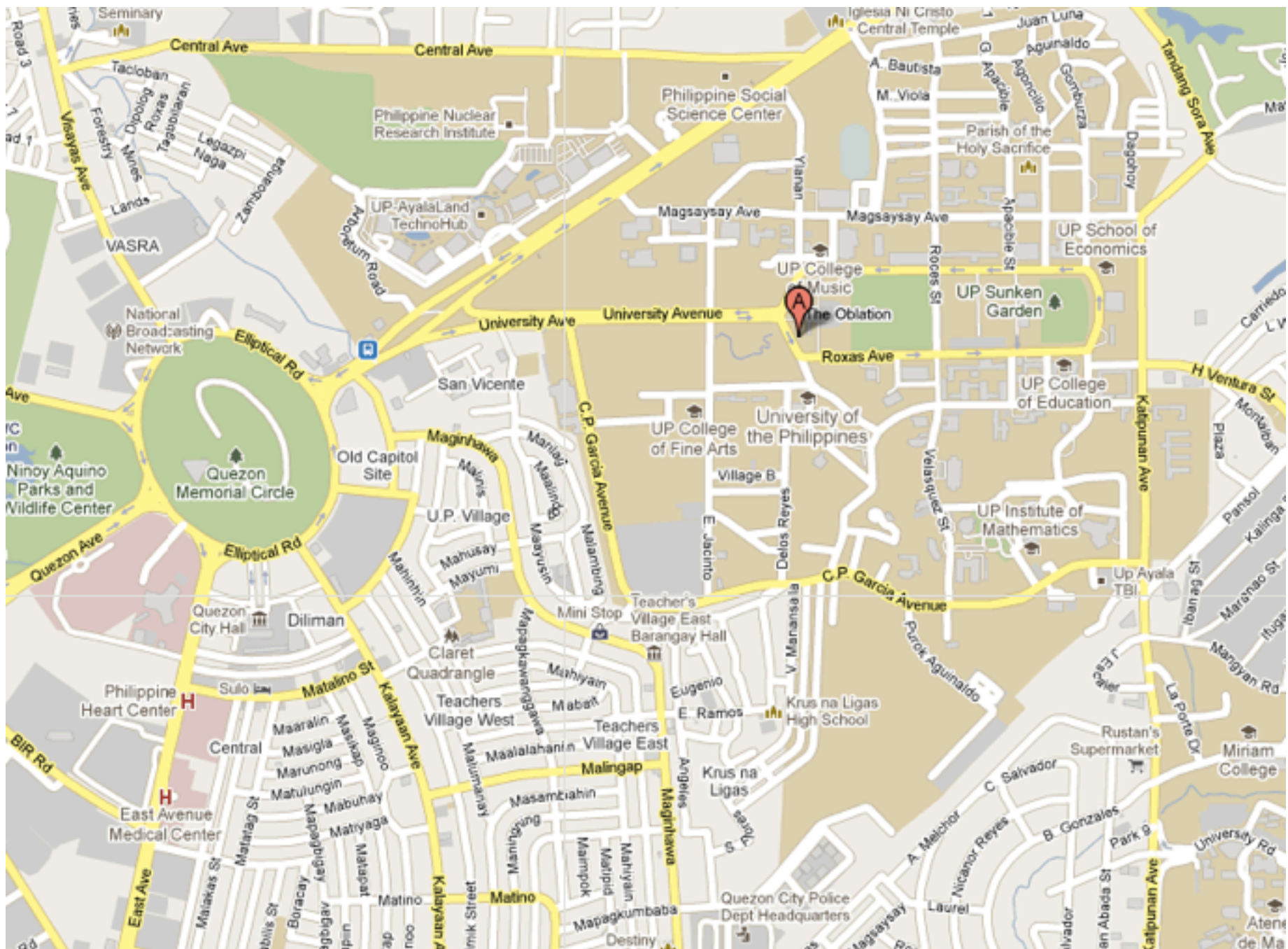
SELECTION AND ORGANIZATION

In this stage, what will appear on the map is determined by the cartographer/s and the commissioner/s of the map. For example, a cartographer may be told by a businessman to draft a map of the businessman's factories. The cartographer shall then draw the factories but shall also think that roads and other transport routes are important, too.

In this stage, what will not appear is intentionally or unintentionally determined. Henceforth, in the example factories may be planned to be drawn but the potential coverage area of emissions can be ignored and not included in the map.

On the next slide is a satellite image of the UP campus area and the slide after it is a road map. In the road map, much features, such as the shape of many residential units are left out in favor of features such as streets, blocks, and territorial shades for clarity of communication.





SCALE AND GENERALIZATION

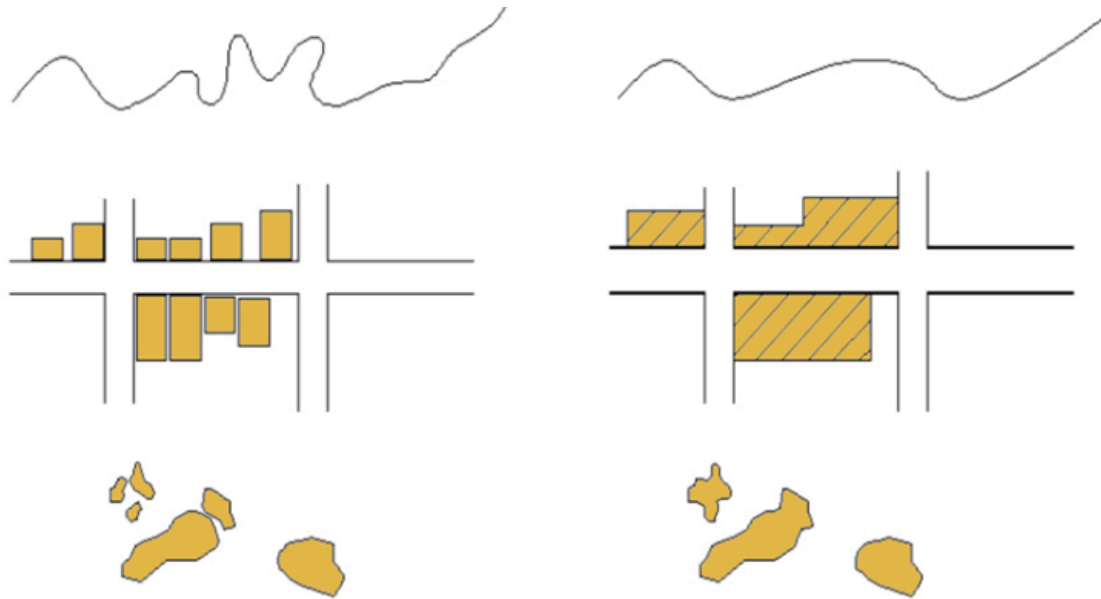
Maps portray a definite land area, which is determined by numerical scale, but the amount of information that can be included in a media – printed or projected – is limited. Hence with numerical scale comes a level of generalization in which important geographic feature and attributes are prioritized. A large-scale (zoomed in) map may portray more specific curves and shapes of a river and its adjoining creeks while a small-scale map of the same river may depict the river using just a line with simpler curves with no creeks attached to the river.

A general rule of thumb that cartographers may follow when making maps is that given the same amount of print/project area (*ceteris paribus*, or assuming everything else as constant), the quality of features increases with increases in numerical scale while the quantity of features decreases with increases in numerical scale.

generalization

abstraction of real-world geographic features symbolized in a map as measured by quantity and/or quality.

low generalization (left) and high generalization (right)



SURFACE AREA REQUIRED TO POWER THE WORLD WITH ZERO CARBON EMISSIONS AND WITH SOLAR ALONE

➔ www.landartgenerator.org



BOXES TO SCALE WITH MAP

- 1980 (based on actual use)**
 207,368 SQUARE KILOMETERS
- 2008 (based on actual use)**
 366,375 SQUARE KILOMETERS
- 2030 (projection)**
 496,805 SQUARE KILOMETERS

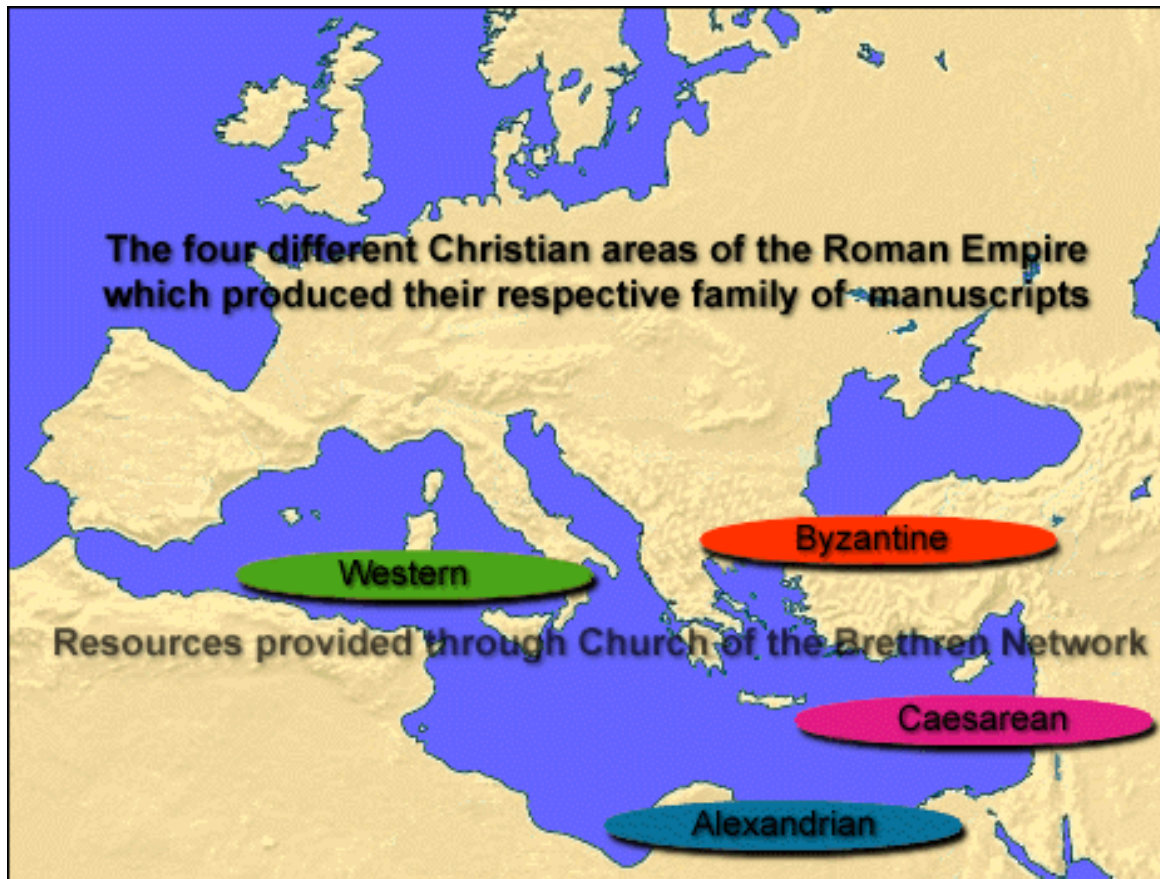
Required area that would be needed in the year 2030 is shown as one large square in the key above and also as distributed around the world relative to use and available sunlight.

- ➔ Areas are calculated based on an assumption of 20% operating efficiency of collection devices and a 2000 hour per year natural solar input of 1000 watts per square meter striking the surface.
- ➔ These 19 areas distributed on the map show roughly what would be a reasonable responsibility for various parts of the world based on 2009 usage. They would be further divided many times, the more the better to reach a diversified infrastructure that localizes use as much as possible.
- ➔ The large square in the Saharan Desert (1/4 of the overall 2030 required area) would power all of Europe and North Africa. Though very large, it is 18 times less than the total area of that desert.
- ➔ The definition of "power" covers the fuel required to run all electrical consumption, all machinery, and all forms of transportation. It is based on the US Department of Energy statistics of worldwide Btu consumption and estimates the 2030 usage (678 quadrillion Btu) to be 44% greater than that of 2008.
- ➔ Area calculations do not include magenta border lines.

LAND ART GENERATOR INITIATIVE

<http://misguidedmaps.com/>

communication problem



<http://cartastrophe.wordpress.com/page/6/>

communication problem



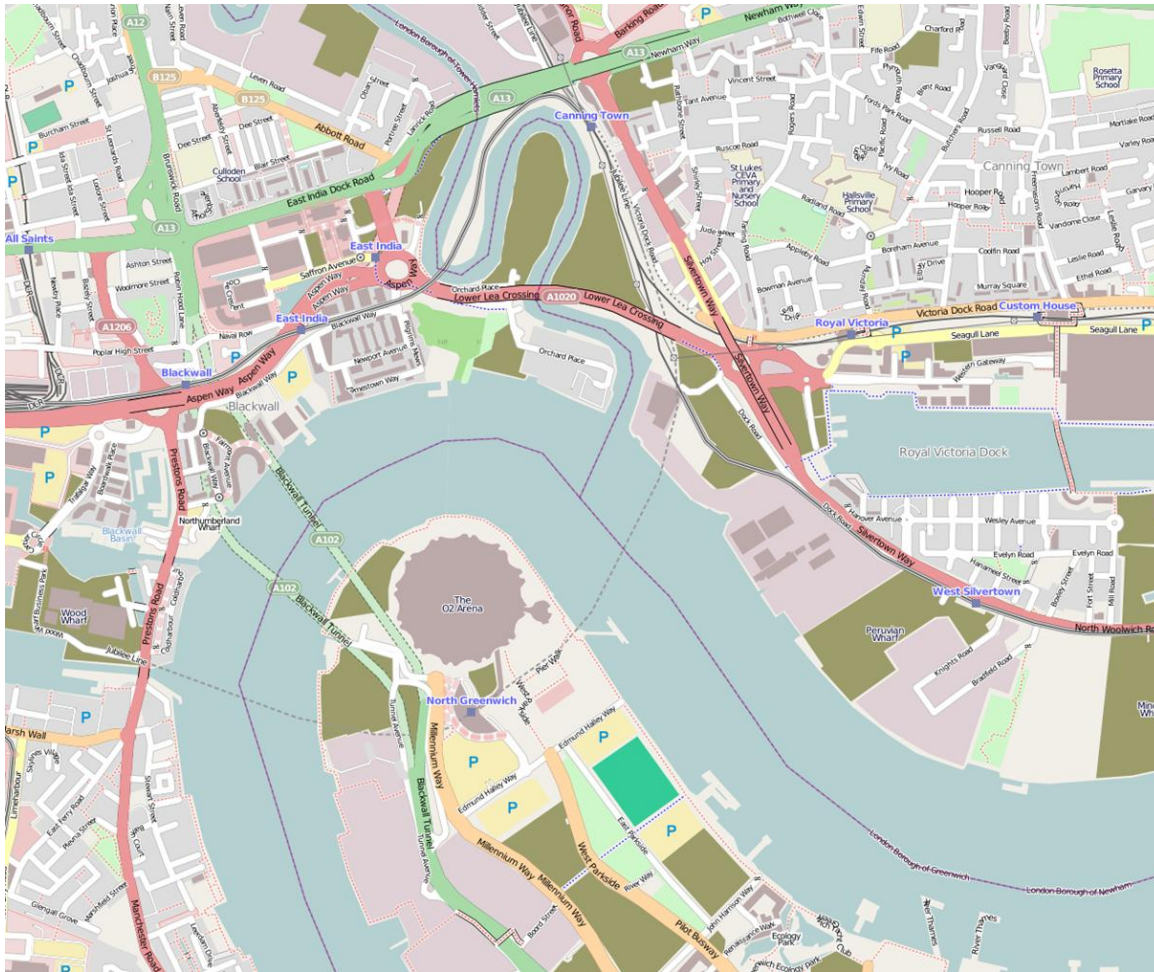
http://4.bp.blogspot.com/_SbGLQgOJrJA/S9x857YGxFI/AAAAAAAAAGYE/QMMlpgmkC3o/s200/h

good and great design



http://www.alkotoelem.hu/wp-content/uploads/2010/03/ORG_ng_2_best_map.jpg

good and great design

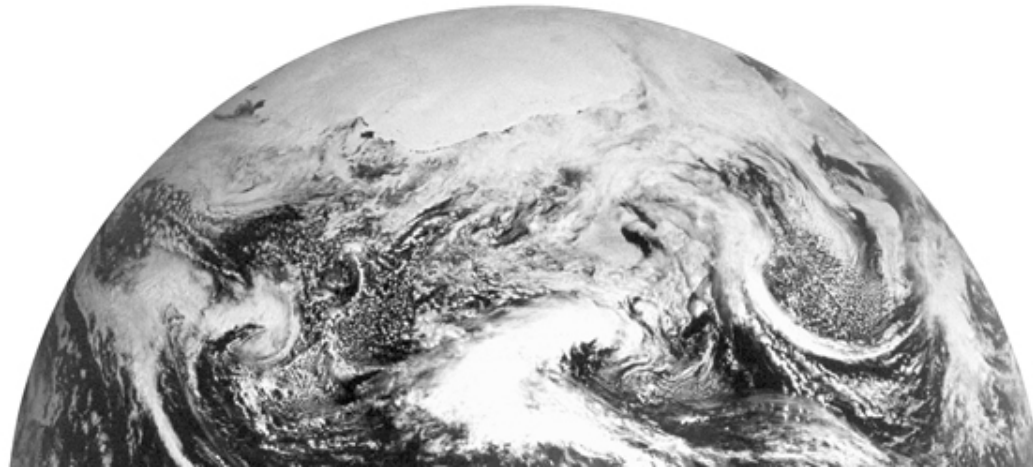


<http://www.mapanalysis.com/images/openstreetmap.jpg>

good and great design

THE MAP IS A MODEL

To be decoded by the map reader.
(communicative approach)



IN OUR CURRENT
SITUATION IN METRO
MANILA, WHAT
SHOULD BE THE ROLE
OF **MAPPING AND
MAPPERS?**

MAPPING CRITICALLY



The UP Economics Society
in partnership with
the Patriots to Recover Sabah Movement
presents



The TRUE MAP of the PHILIPPINES

A symposium on the
Philippine Sabah claim

JULY 24, 2013: 5-8PM
UP School of Economics Auditorium

Featured speakers:

HM Sultan Muhammad Fuad Abdulla Kiram
Sultan of Sulu and Sabah

HRH Prince Omar Kiram
Grand Prince and Prince Marshall

HE Marquis General Habib Nikabulin
Royal Minister for Sharif Affairs

**Required event for organizations
that want to hold the ACLE.*

CRITICAL APPROACHES

Politics and ideology

Map Monsters

Prejudice

Map as symbol of state

Generalization

Blunders

Maps that advertise

Disorientation and reorientation

Integration

Maps evoke and express imagination and intention.

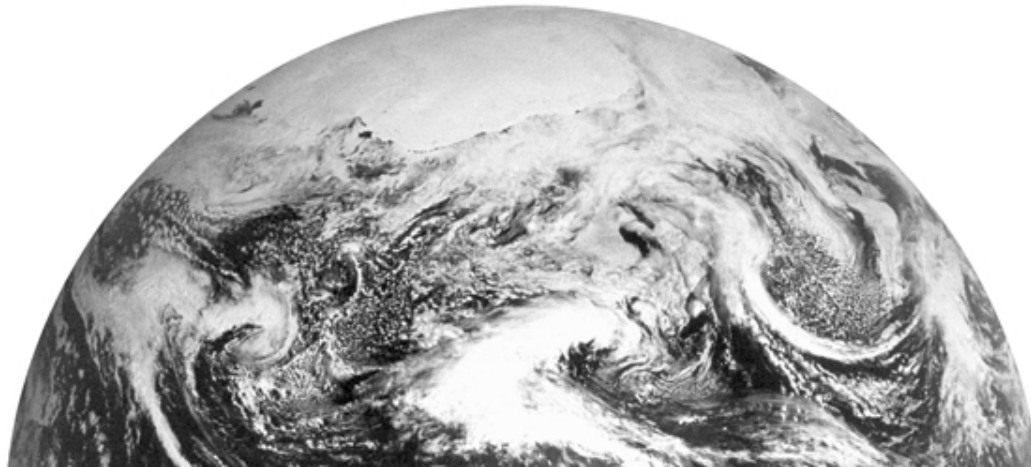
Maps are power tools.

Maps always lie.

Maps record resources and are resource in themselves.

THE ESSENCE OF TECHNOLOGY

is by no means anything technical
(Martin Heidegger)



CRITICAL APPROACHES

It is unusual that we perceive places using coordinates at all times. The communicative/behavioral approach largely ignored the causes behind the map readers' response to visual stimuli. Such causes are knowledge, attitudes, behaviors, and other held meanings that the map readers use when making, distributing, and interpreting maps. Also, much attention was put by the communicative/behavioral approach on communicating the content and not on the content itself.

Thus there were critical alternatives to formal, communicative and behavioral approaches in the design, distribution, interpretation, and study of maps and related knowledge. Such critical approaches focused on purposes, contexts, reproduction of cartographic knowledge, map interpretation, uses and effects of maps, and what Jeremy Crampton called cartographic anxiety.

CRITICAL APPROACHES

The lack of critical perspectives in map design, use, distribution, interpretation, and study might be due to the influence of the positivist tradition. Also, maps are commonly seen as something technical like a neutral tool. It is argued, however, that in reality map-related activities do not happen as purely technical events. Instead, they are tied to purposes, subject to various interpretations of people of different backgrounds, and are catalysts for the reproduction of social and spatial norms.

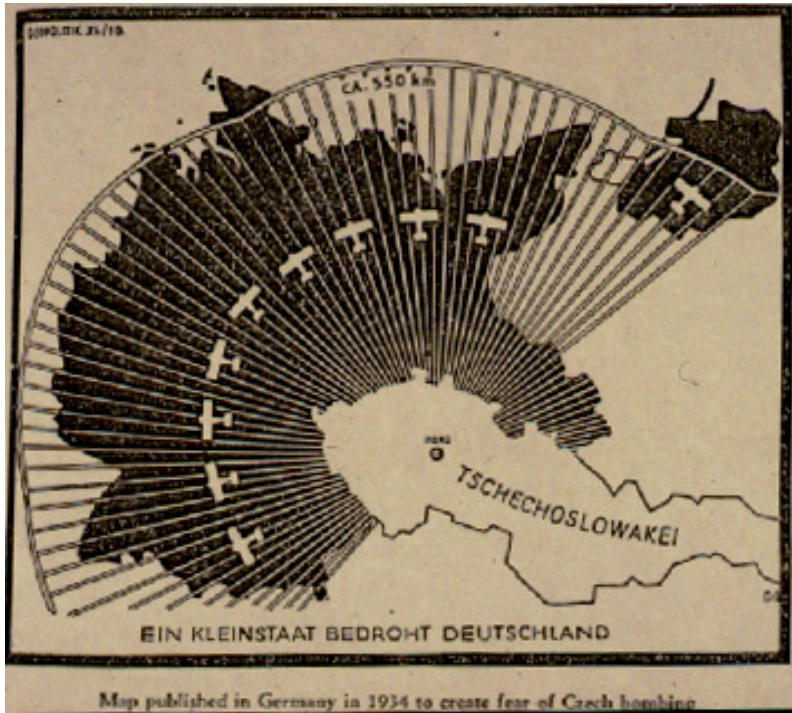
As Martin Heidegger put it, “the essence of technology is by no means anything technical.”

CRITICAL APPROACHES

Map makers do not make maps in a completely objective and neutral manner. Alternatively, they practice cartography for reasons other than for cartography's and communication's sake alone. Mappers intentionally and unintentionally serve purposes that are intended to benefit particular groups of people. A map can be for the depiction of a territory of a nation-state and sometimes such assertions of areal dominion goes unquestioned.

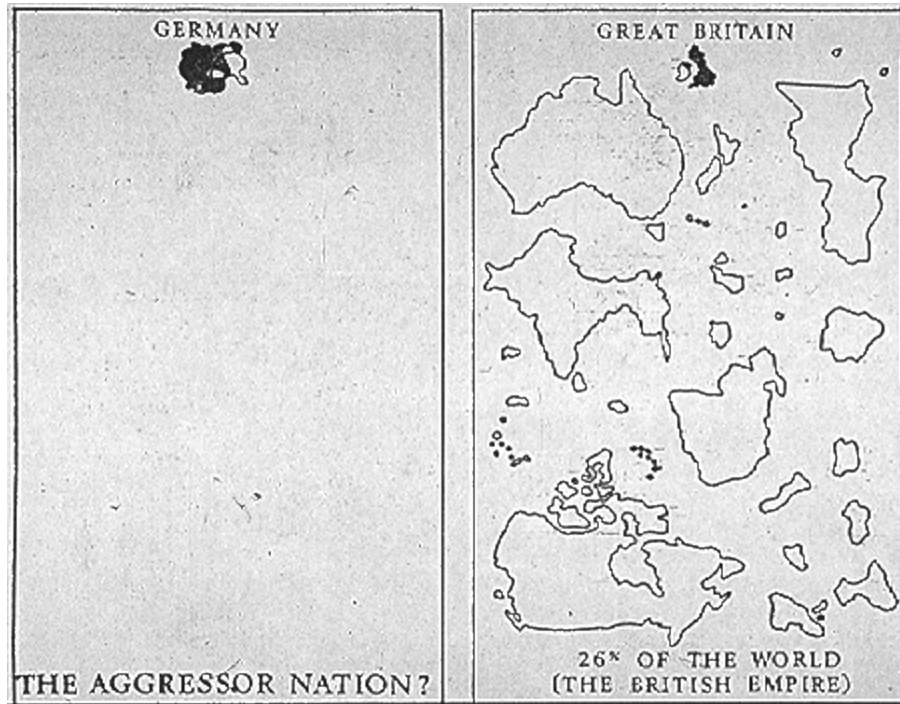
CRITICAL APPROACHES: CONTEXTS

Maps are made within political, historical, social, economic, and cultural contexts. During the Cold War, maps that portray the close distance between the USA and the USSR over the north pole were used for propaganda. Cartographers in the age of imperialism depicted the New World – including North America – as one large expanse of land to be occupied. The boundaries of North American civilizations were not delineated at times. Social contexts as reflected in little collective knowledge were where early cartographers worked in when they mapped the New World.



<http://strangemaps.files.wordpress.com/2006/12/threat.jpg>
http://www.bbc.co.uk/bitesize/higher/history/images/czech_1933.gif

politics and ideology



<http://strangemaps.files.wordpress.com/2006/12/threat.jpg>
http://www.bbc.co.uk/bitesize/higher/history/images/czech_1933.gif

politics and ideology

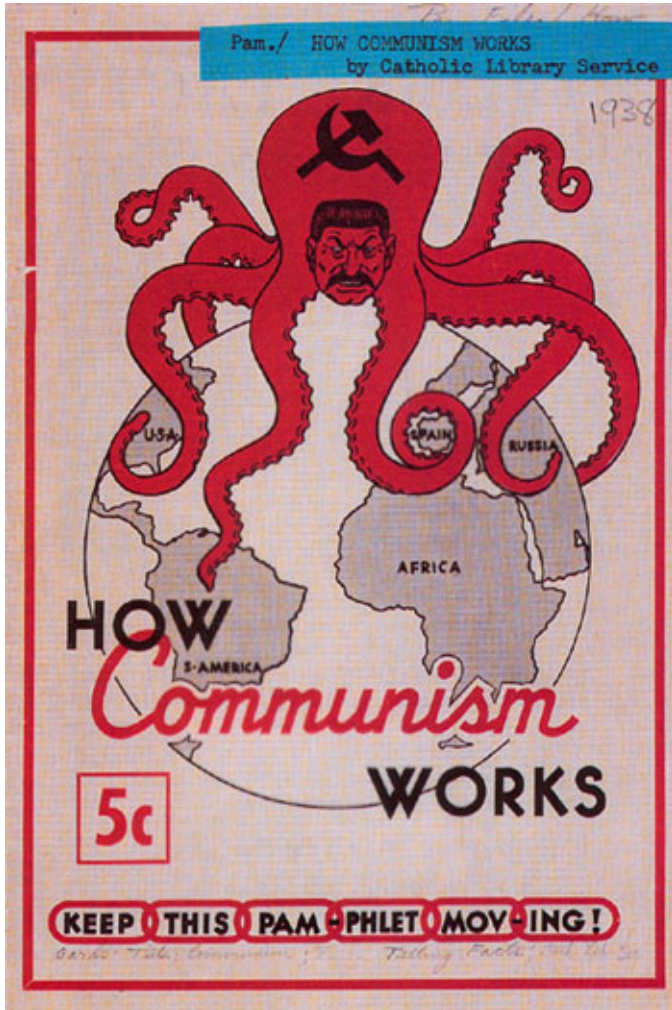
THE HISTORICAL DEVELOPMENT OF THE BRITISH EMPIRE





<http://bigthink.com/strange-maps/521-cartography-favourite-map-monster-the-land-octopus>

politics and ideology



<http://bigthink.com/strange-maps/521-cartography-favourite-map-monster-the-land-octopus>

politics and ideology



<http://bigthink.com/strange-maps/521-cartographys-favourite-map-monster-the-land-octopus>

politics and ideology



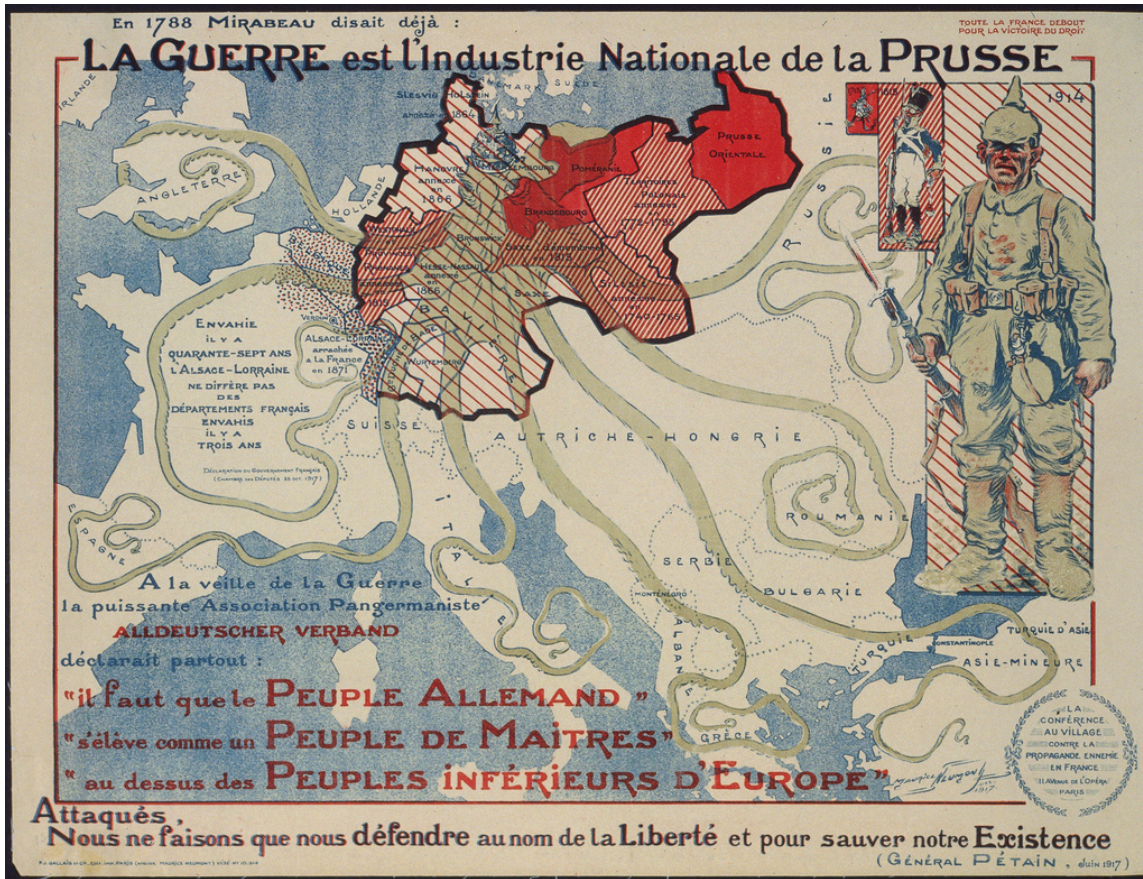
<http://bigthink.com/strange-maps/521-cartographys-favourite-map-monster-the-land-octopus>

politics and ideology



<http://bigthink.com/strange-maps/521-cartographys-favourite-map-monster-the-land-octopus>

politics and ideology



<http://bigthink.com/strange-maps/521-cartographies-favourite-map-monster-the-land-octopus>

politics and ideology

Decke

Meerwunder und seltsame Thier/ wie Sie in den Dinächtigen Ländern/ im Meer
und auff dem Lande gefunden werden.

Decke



Man v. Warder

<http://bigthink.com/strange-maps/600-munsters-monster-mash>

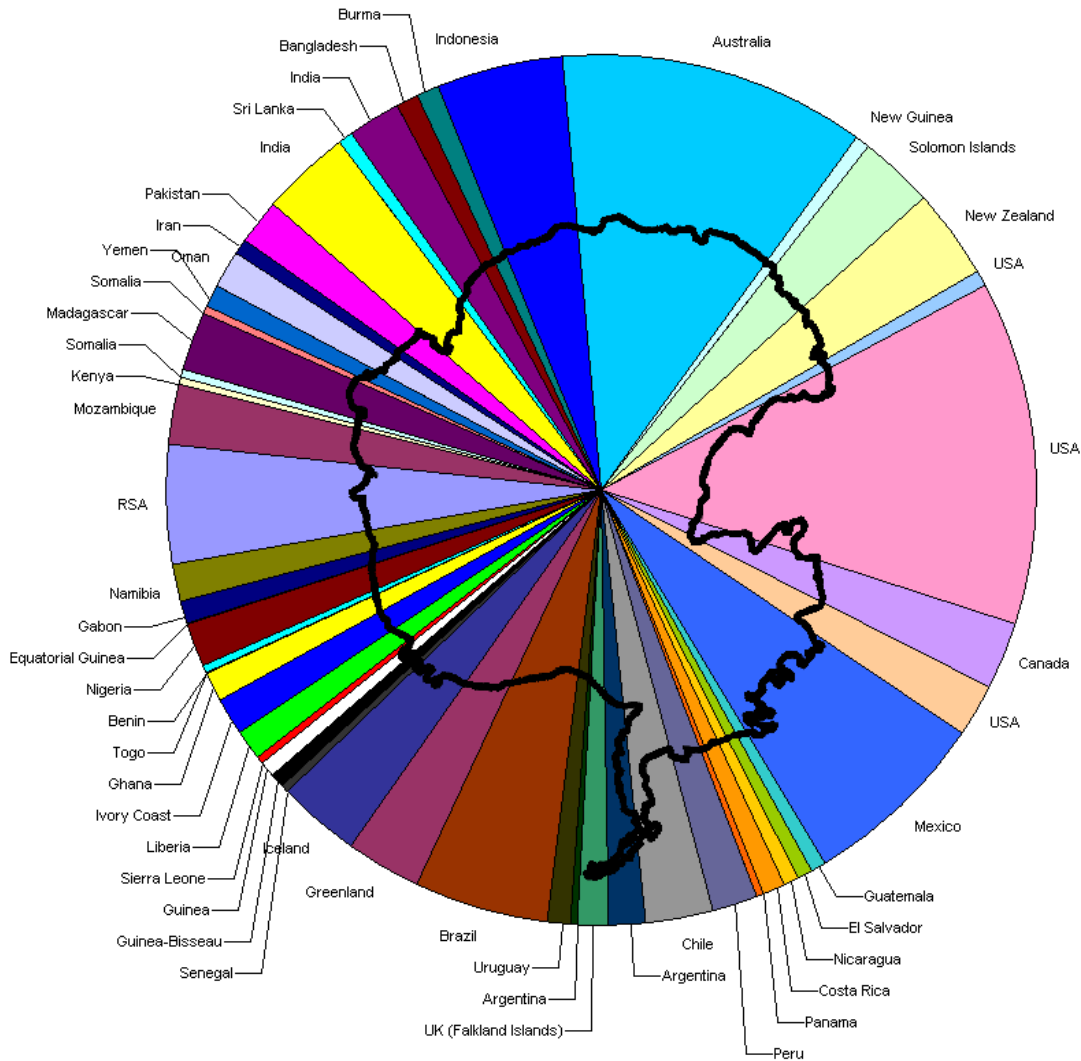
map monsters



FIGURE 7.4. Subtle and not-so-subtle cartographic propaganda on Argentinian postage stamps.

Monmonier, Mark. How to Lie with Maps.

state symbol



http://strangemaps.files.wordpress.com/2007/11/antarctic_pie21.png

state symbol

EUROPE ACCORDING TO THE USA 2012

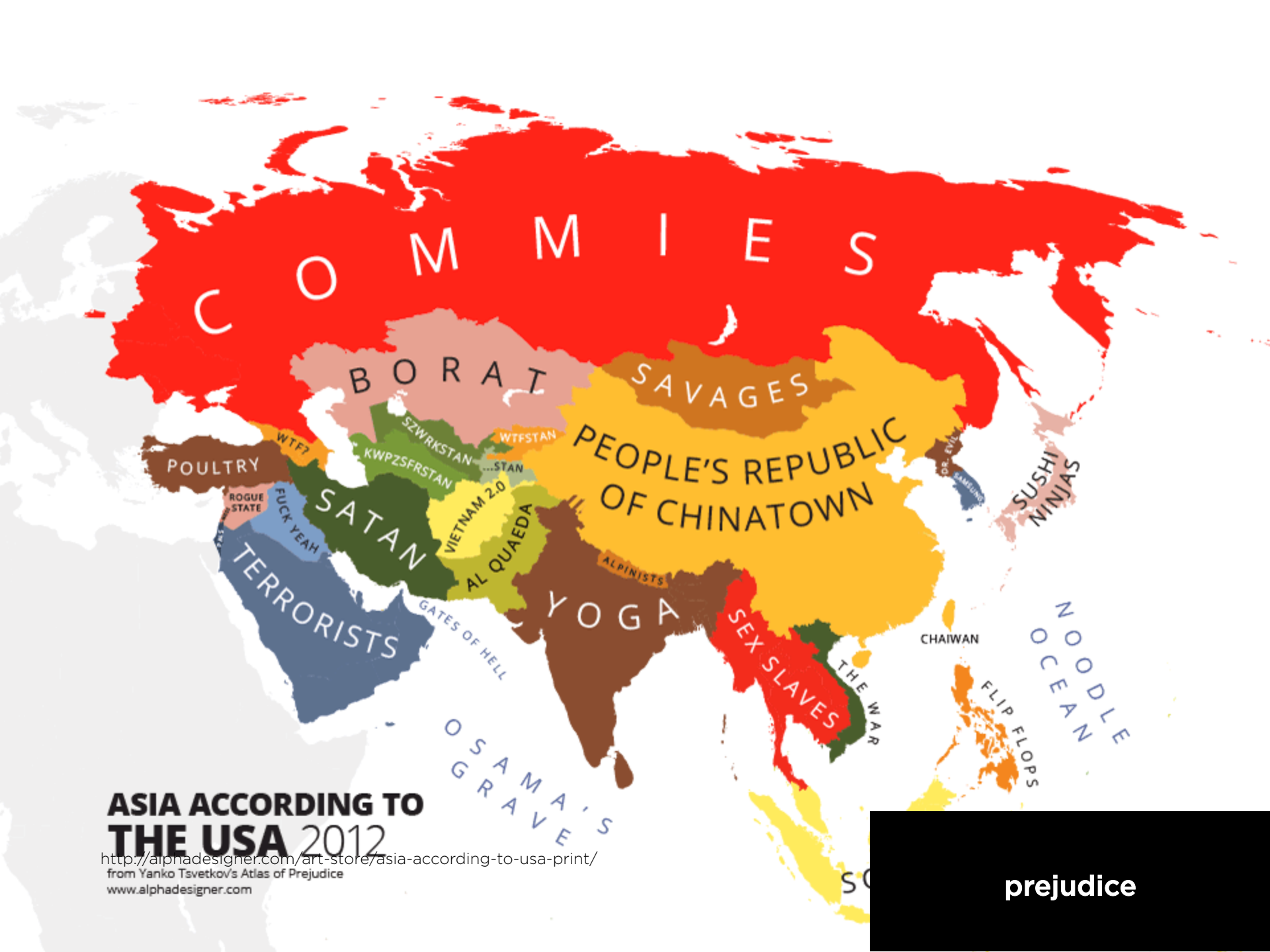
from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

ICE CAP



<http://alphadesigner.com/art-store/europe-according-to-usa-print/>

prejudice



ASIA ACCORDING TO THE USA 2012

<http://alphadesigner.com/art-store/asia-according-to-usa-print/>
from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

prejudice

NORTH AMERICA ACCORDING TO THE USA 2012

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com



<http://alphadesigner.com/art-store/north-america-according-to-usa-print/>

prejudice

SOUTH AMERICA ACCORDING TO THE USA 2012

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com



<http://alphadesigner.com/art-store/south-america-according-to-usa-print/>

prejudice

AFRICA ACCORDING TO THE USA 2012

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com



<http://alphadesigner.com/art-store/africa-according-to-usa-print/>

prejudice

OCEANIA ACCORDING TO THE USA 2012

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

OSAMA'S
GRAVE

NOODLE
OCEAN

KANGAROO
RIDERS

SEA OF
CROCS

CARTOON
ISLAND

THE SHIRE

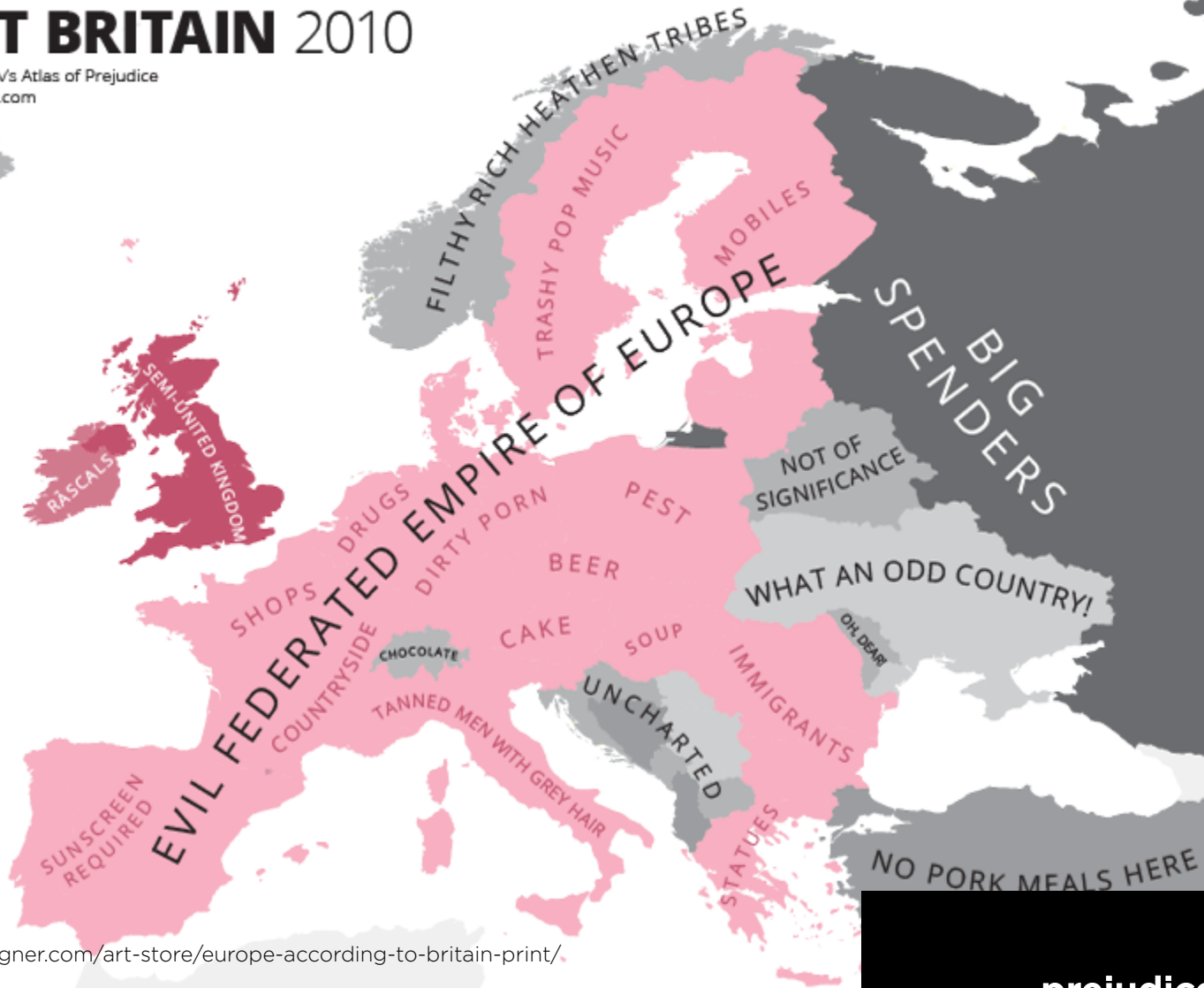
<http://alphadesigner.com/art-store/oceania-according-to-usa-print/>

prejudice

EUROPE ACCORDING TO GREAT BRITAIN 2010

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

LAS VEGAS



<http://alphadesigner.com/art-store/europe-according-to-britain-print/>

prejudice

EUROPE ACCORDING TO THE VATICAN 2010

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

HELL

LEGEND

-  Righteous people
-  Misguided brothers
-  Bastards
-  Virgin Mary vacation spots



<http://alphadesigner.com/art-store/europe-according-to-the-vatican-print/>

prejudice

WORLD DICTATORSHIPS ACCORDING TO THE USA 2010

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com



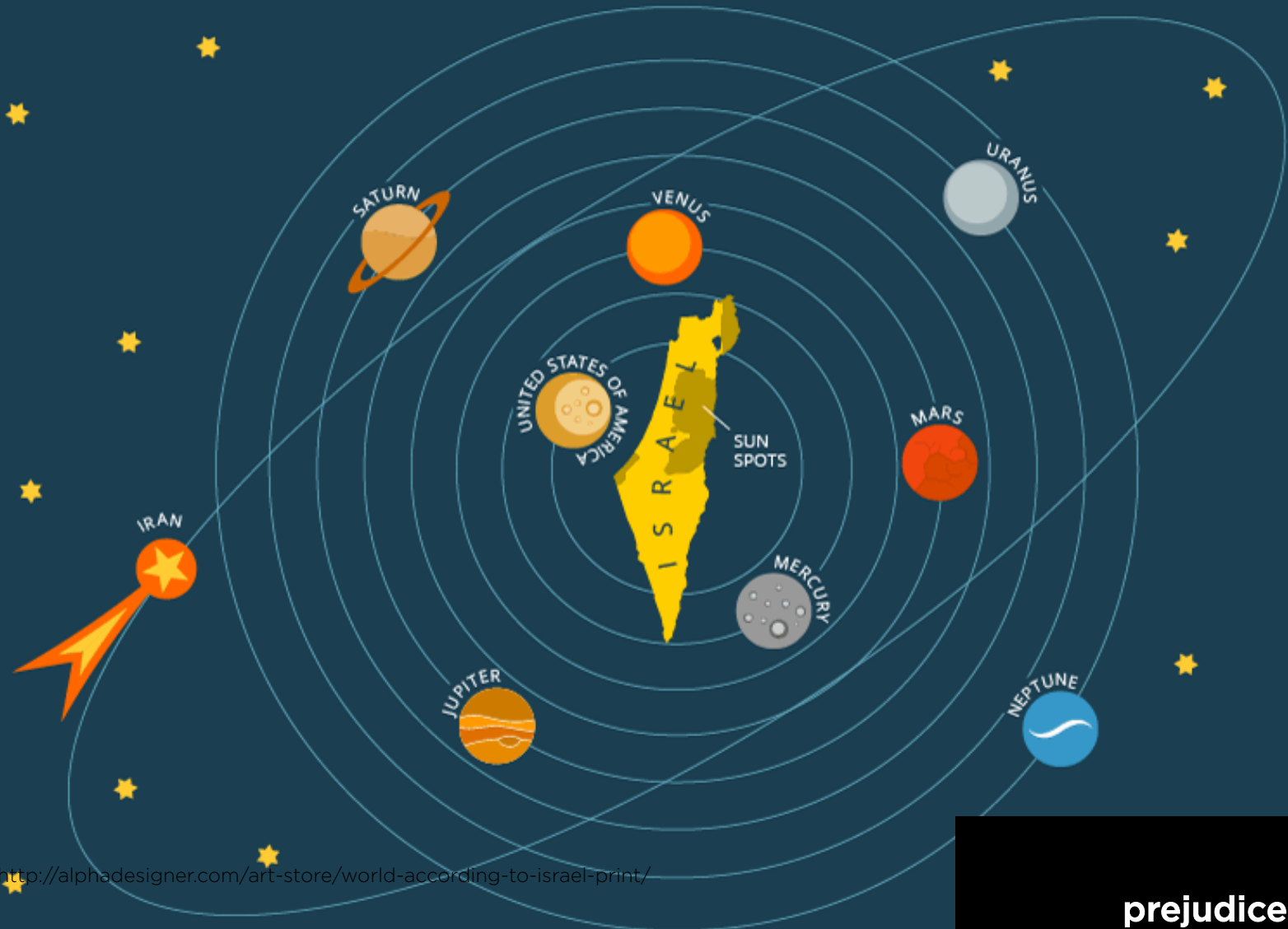
- Dictatorships we gladly support
- Dictators that don't like us, so we hate them too
- Russia, always dangerous
- Dictators under Russian influence (do not invade)
- China, we pretend to oppose them
- Dictators under Chinese influence (do not invade)
- Random unimportant dictators
- Rest of the world

<http://alphadesigner.com/art-store/usa-and-the-world-of-dictatorships-print/>

prejudice

THE WORLD ACCORDING TO ISRAEL 2012

from Yanko Tsvetkov's Atlas of Prejudice
www.alphadesigner.com

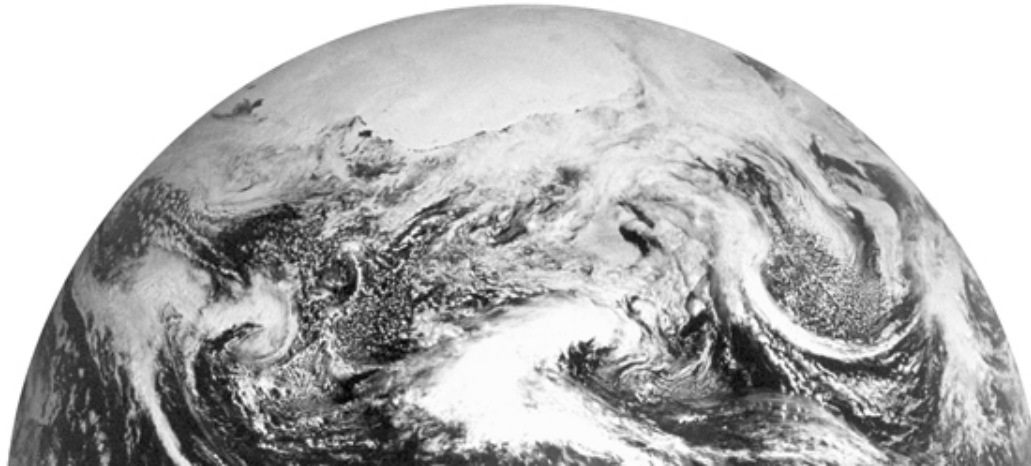


<http://alphadesigner.com/art-store/world-according-to-israel-print/>

prejudice

THE MAP

is the perfect symbol of the state.
Mark Monmonier.



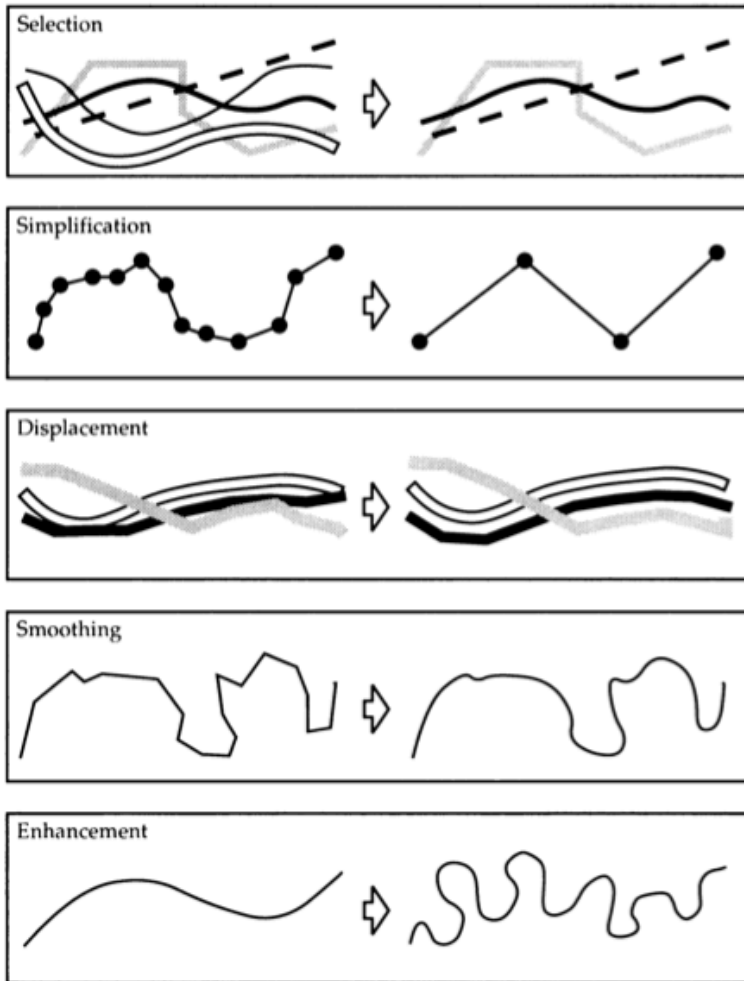


FIGURE 3.1. Elementary geometric operations in the generalization of line features.

Monmonier, Mark. How to Lie with Maps.

generalization

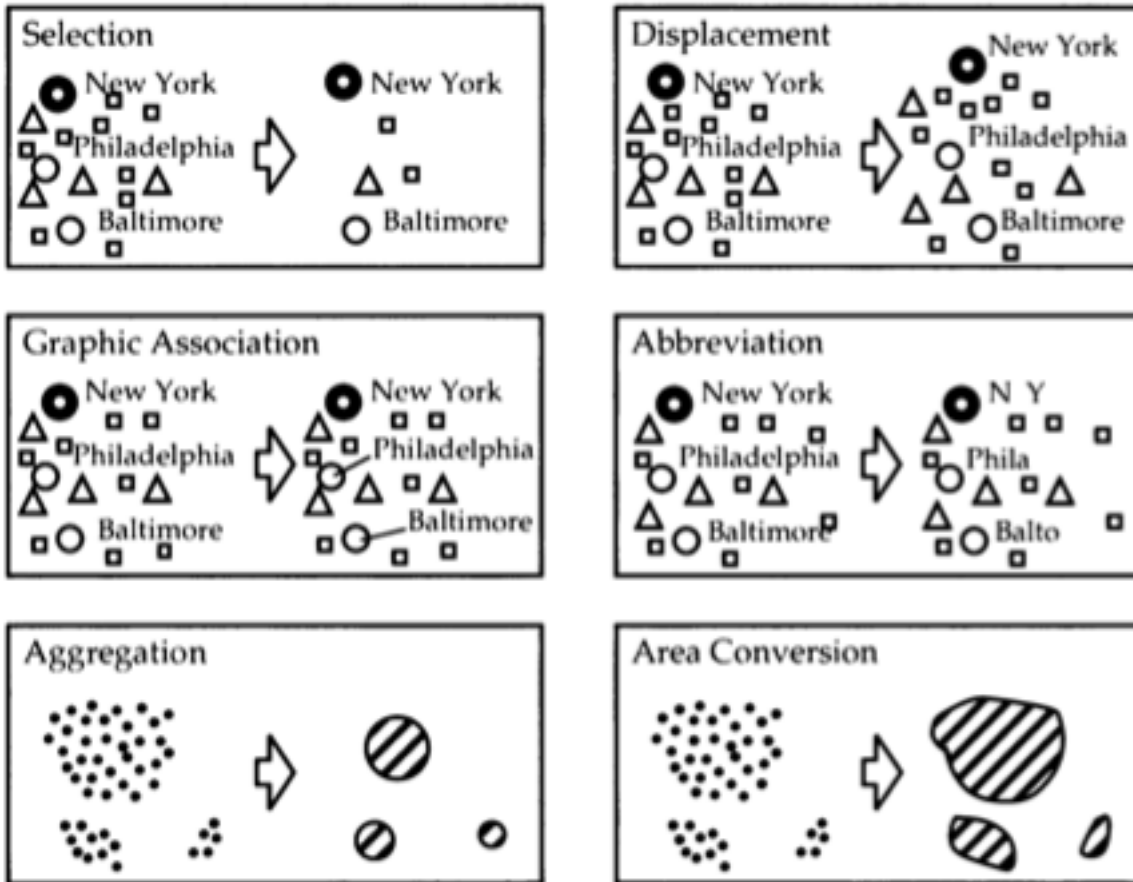


FIGURE 3.2. Elementary geometric operations in the generalization of point features and map labels.

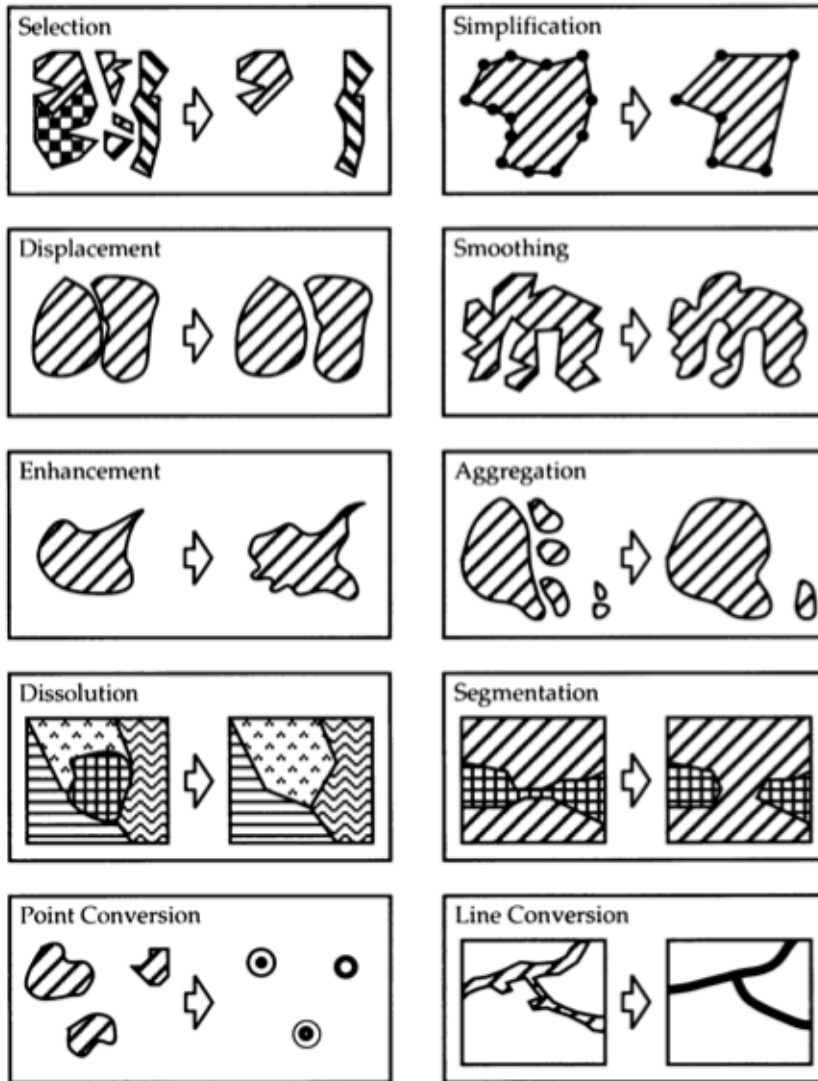


FIGURE 3.3. Elementary geometric operations in the generalization of area features.

Monmonier, Mark. How to Lie with Maps.

generalization

WORLD VIEW WESTEROS & ESSOS

The Shivering Sea

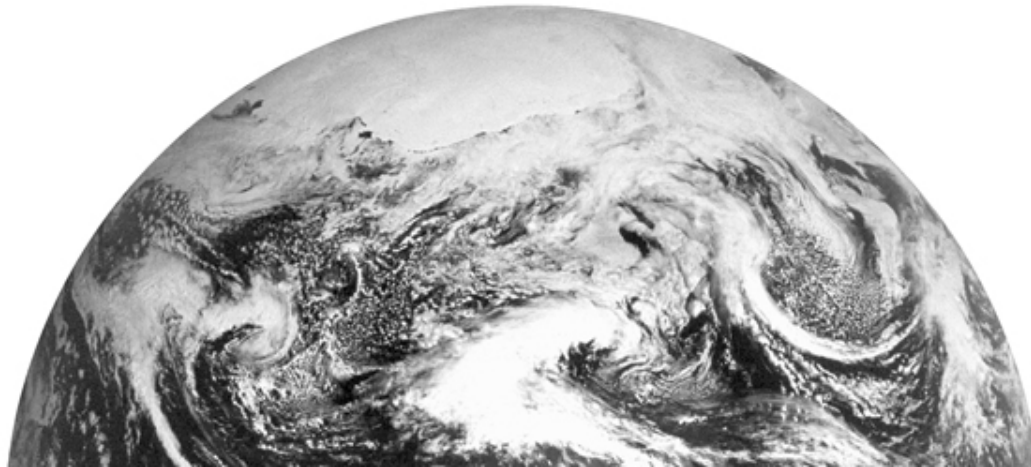


http://thronesblog.com/wp-content/uploads/2012/05/Westeros_and_Essos.jpg

intention

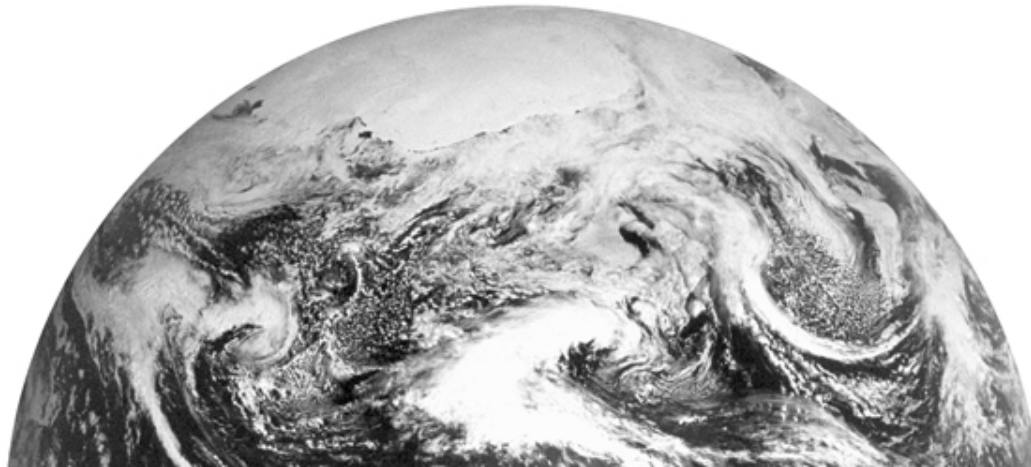
WE BELIEVE

That maps only reflect reality. They don't.
Maps also reflect our intentions, desires, and goals.



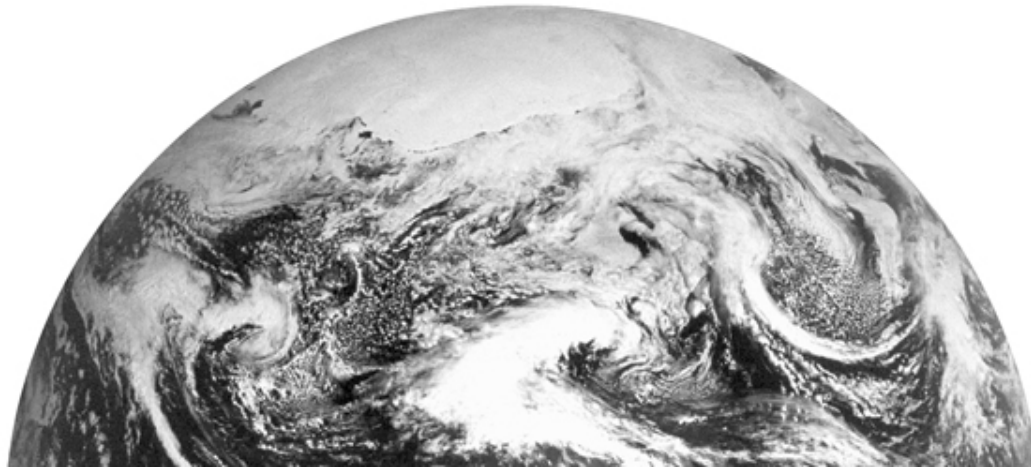
THEREFORE, THERE CAN BE DIFFERENCES

Between our cartographic wishes and the such wishes of others
and between our wishes are what is actually out there.



IF THERE CAN BE SUCH DIFFERENCE

then are maps still graphic representations of spatial **reality**?



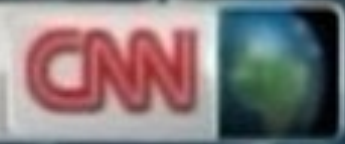


http://www.huffingtonpost.co.uk/2012/01/30/cnn-blunder-london-norwich_n_1241208.html

blunder



BREAKING NEWS
REBELS IN TRIPOLI
Gadhafi whereabouts unknown



<http://www.dailymail.co.uk/news/article-2093986/CNN-news-map-locates-London-NORFOLK.html>

blunder



<http://www.dailymail.co.uk/news/article-2093986/CNN-news-map-locates-London-NORFOLK.html>

blunder



<http://www.dailymail.co.uk/news/article-2093986/CNN-news-map-locates-London-NORFOLK.html>

blunder

THE MIDDLE EAST

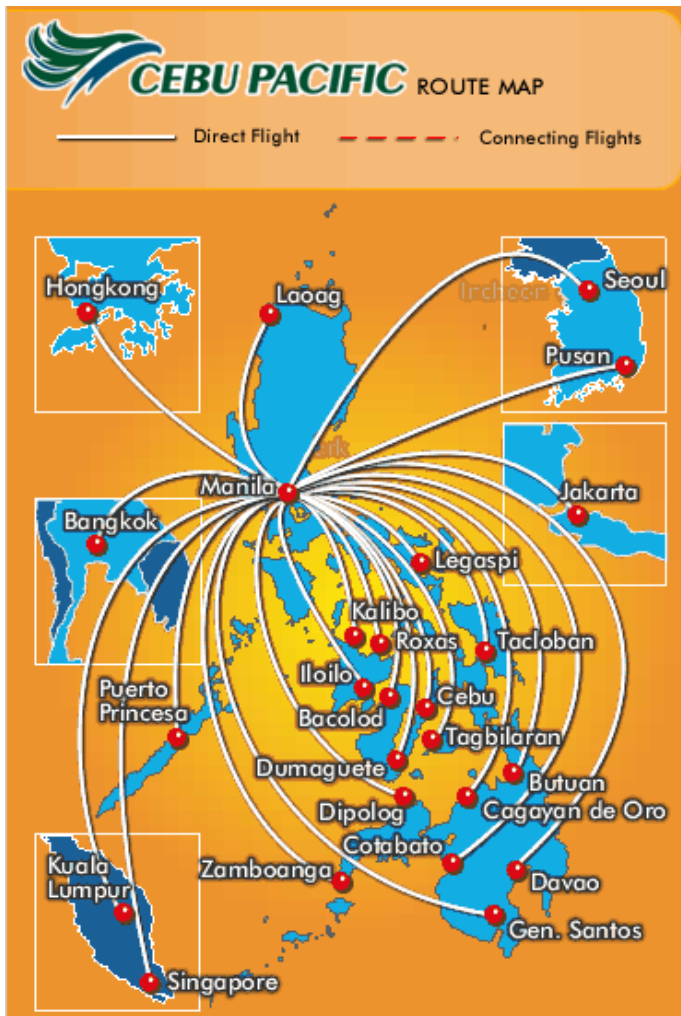


SECY GATES MEETING WITH ISRAEL'S
MINISTER OF DEFENSE EHUD BARAK

LIVEDESK

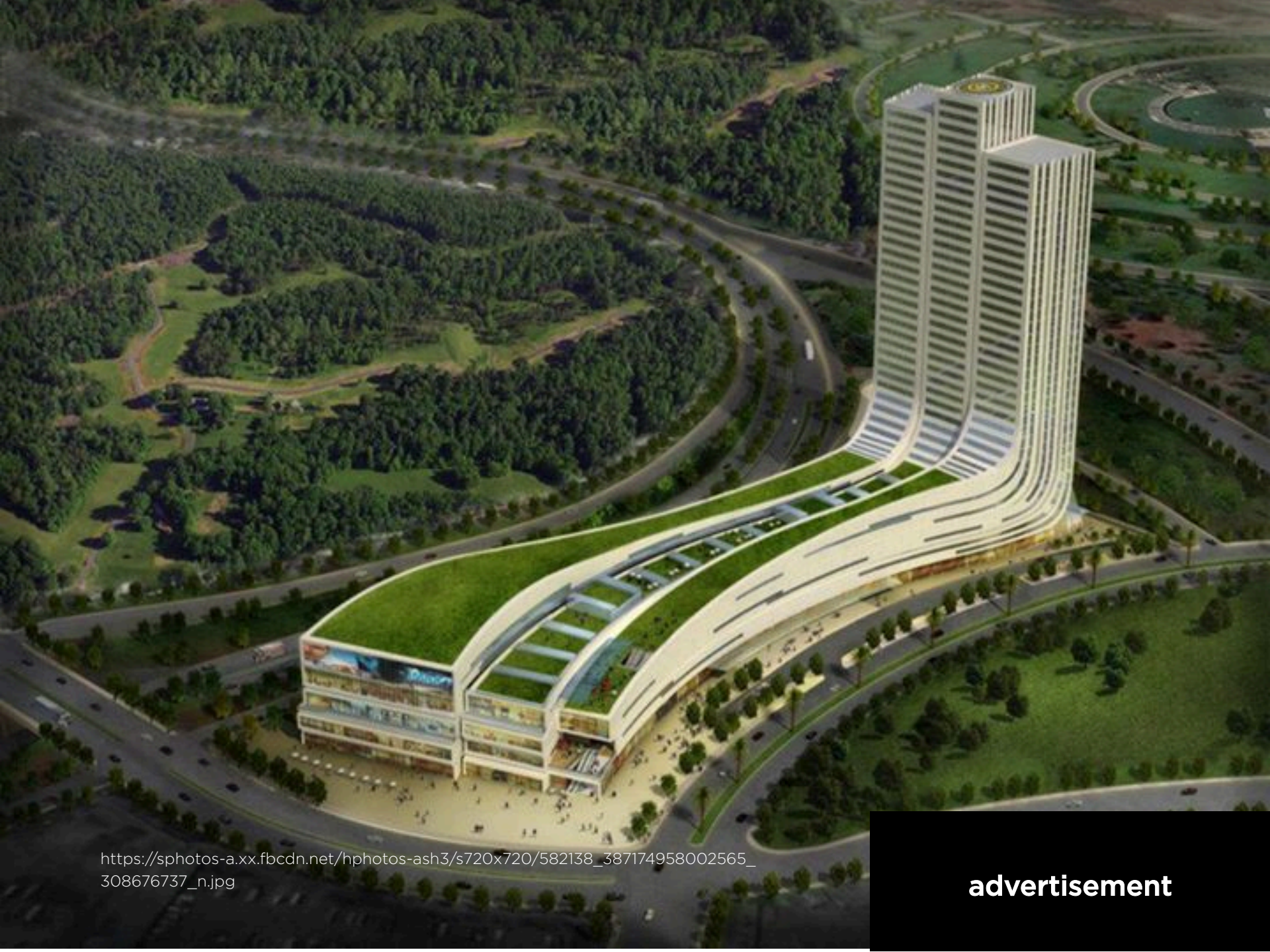
http://www.huffingtonpost.com/2011/01/31/fox-news-cant-find-egypt-map_n_816540.html

blunder



http://www.airlineroutemaps.com/East_Asia/img/Cebu_Pacific_manila.gif

advertisement



https://sphotos-a.xx.fbcdn.net/hphotos-ash3/s720x720/582138_387174958002565_308676737_n.jpg

advertisement

HIGHLY ACCESSIBLE

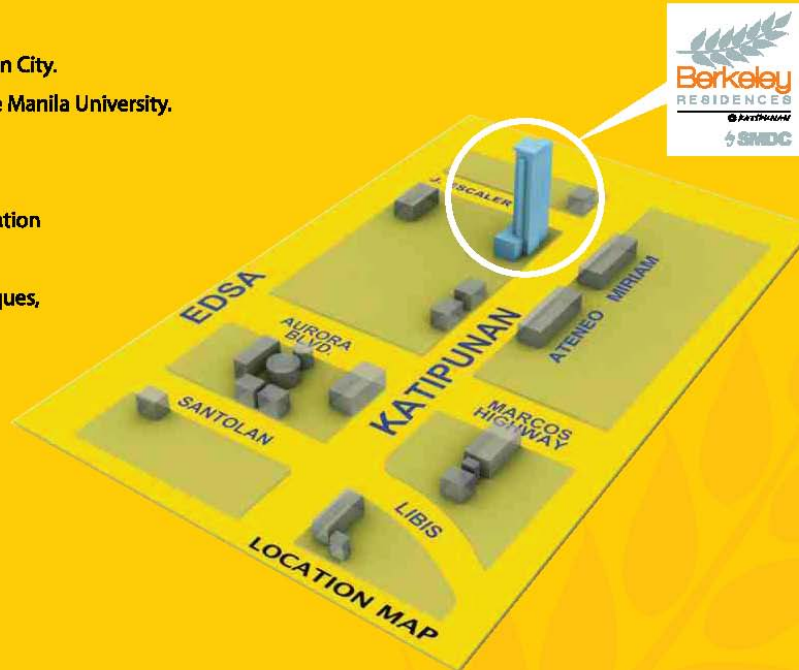
Strategically located at the corner of **EDSA** and **QUEZON AVENUE**



http://www.bestrealspot.com/images/content/onecentrisplace/location_map.jpg

advertisement

- Located along Katipunan Avenue in Quezon City.
- Right across Miriam College and Ateneo de Manila University.
- A few minutes away from UP Diliman.
- 10 minute drive to SM Marikina.
- Accessible by private and public transportation with LRT 2 station just minutes away.
- Stroll away from convenience stores, boutiques, cafes, and churches.



Premium Location

All information stated is intended to give a general overview of the project. The developer reserves the right to modify as it sees fit without prior notice.

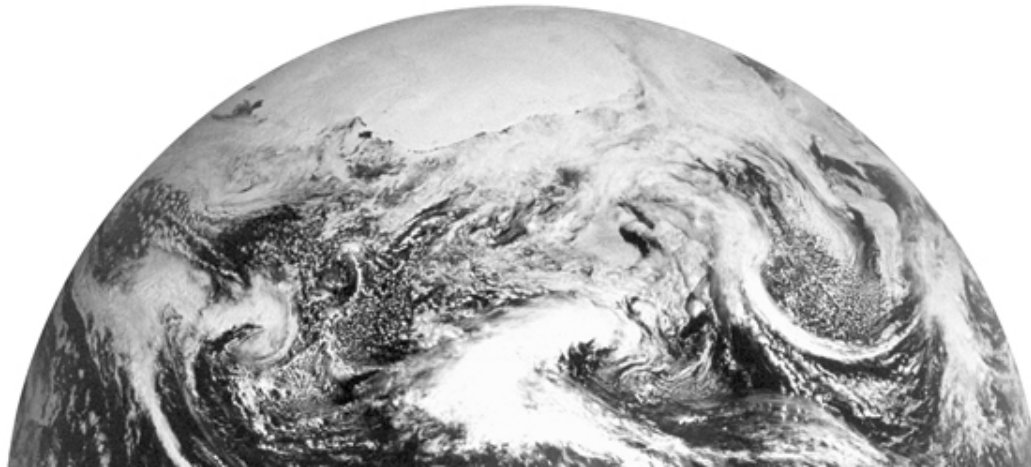
<http://www.smbleresidences.com/wp-content/uploads/2012/11/SM-Berkeley-Residences-Location-Map.jpg>

advertisement

MAPS SIGNIFY OUR PRIORITIES

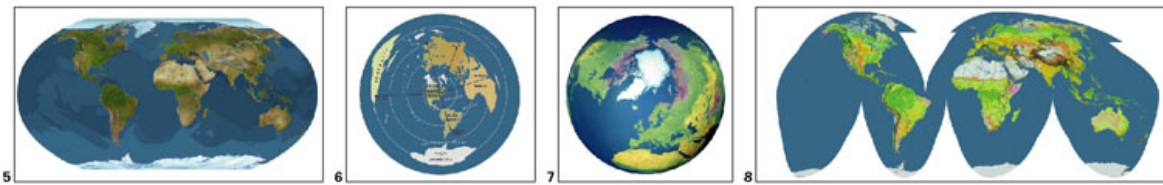
Citizens that think their country is the center of the world. Provinces that assert their island is the center of the Philippines. Developers touting that their units are at the heart of Metropolitan Manila. That's common.

and the girlfriend as the center of the universe.

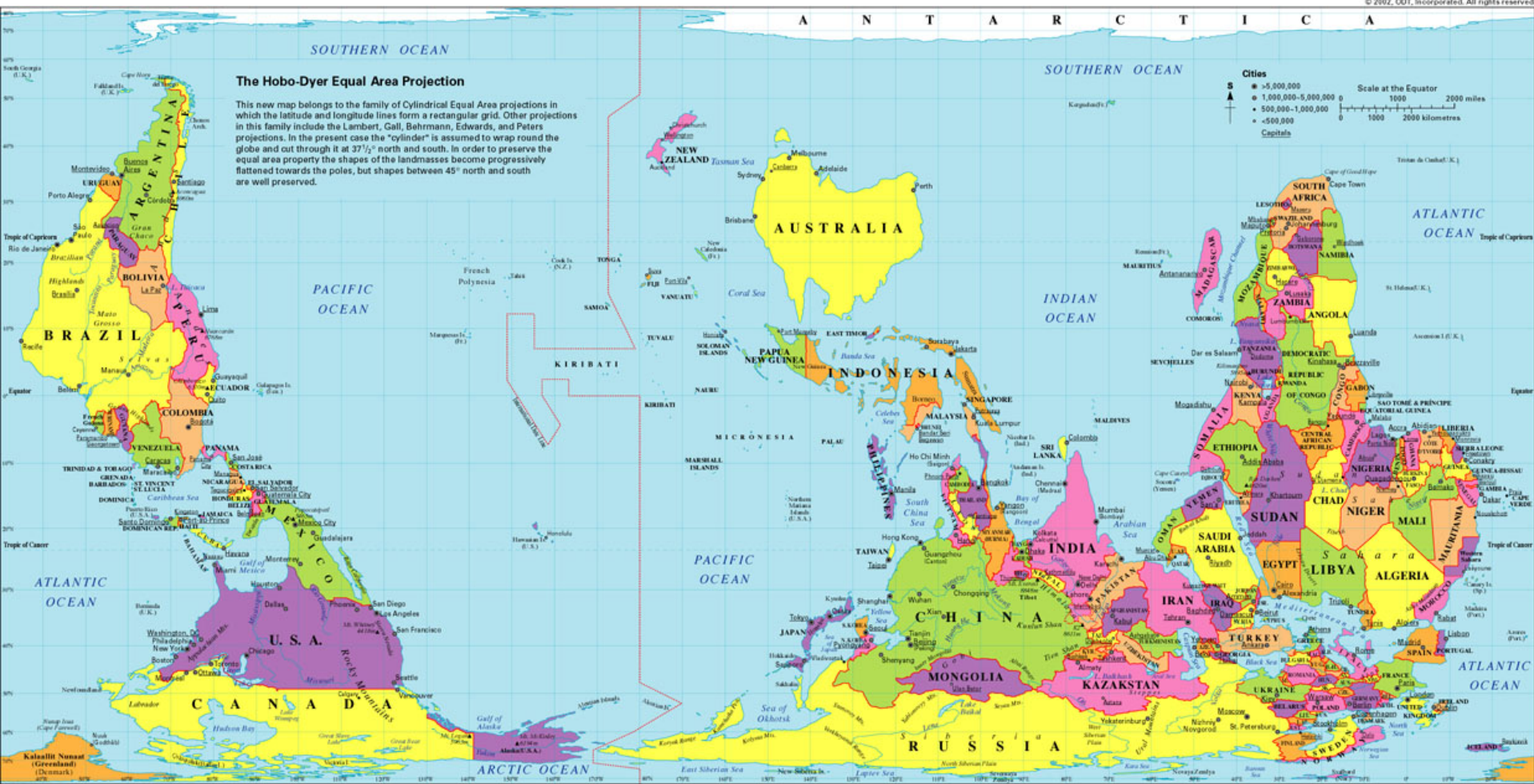


Take the quiz! Compare country size.
 Which of the images on both sides of this placemat are "area accurate?" How is the Hobo-Dyer projection below different from the one on the reverse side? Answers and details about all the images are at www.odt.org/hdp. To the right:

- (5) Van Sant's Geosphere,
- (6) Guellet's Toronto-centered projection,
- (7) the Oxford Globe,
- (8) Goode's Homolosine



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<http://flourish.org/upsidedownmap/hobodier-large.jpg>

disorientation and reorientation

THIS IS MY WORLD



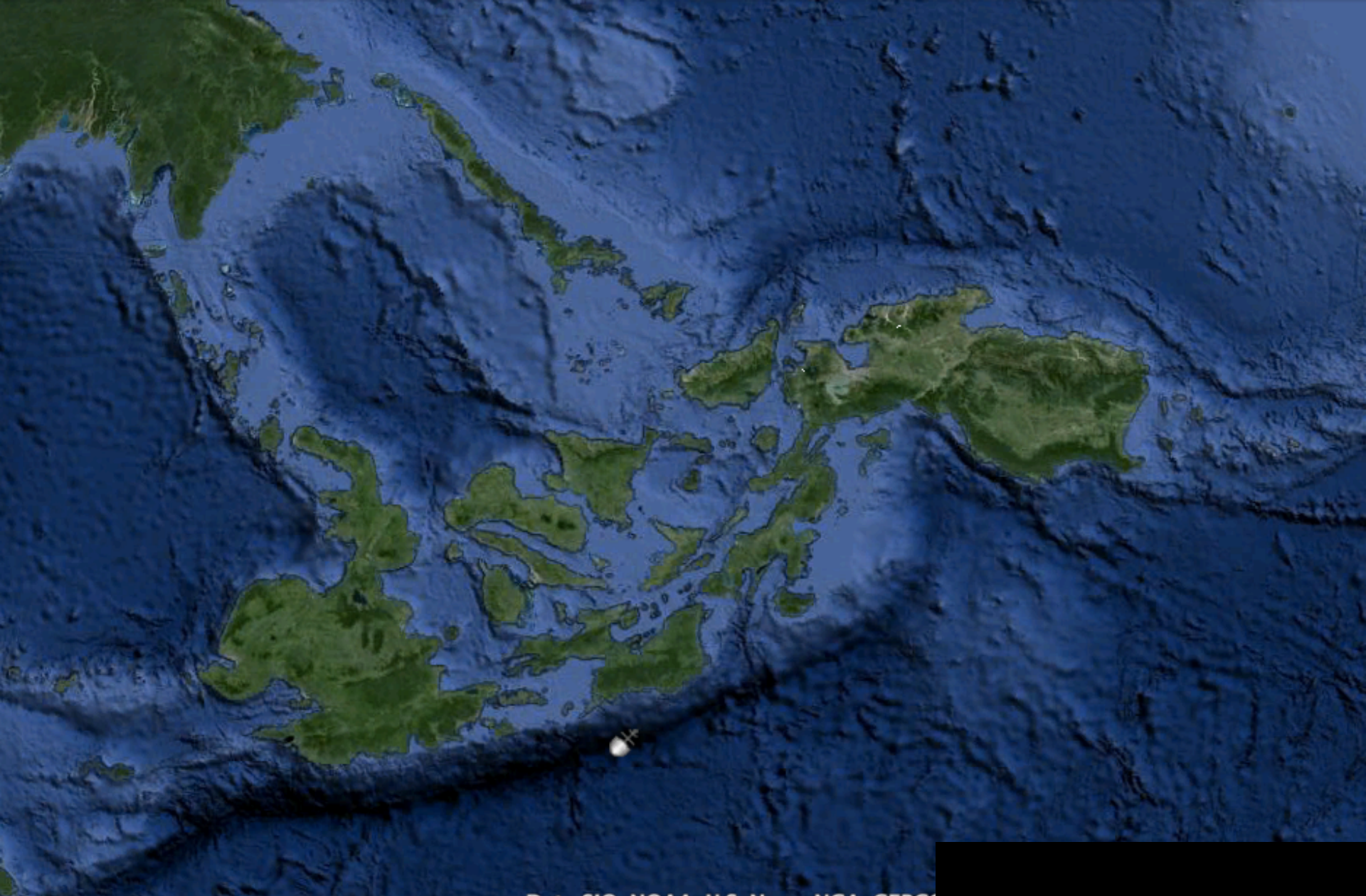
http://1.bp.blogspot.com/-qyE7IRSoswl/UEqZC1KNfCl/AAAAAAAAAQM/2QdDHD0IdAM/s1600/my_world__upside_down_map_by_jamaicavb-d4ufao6.jpg

**disorientation and
reorientation**



http://about-australia-shop.com/images/products/Postcard:_Upside_Down_World_Map_4039.jpg

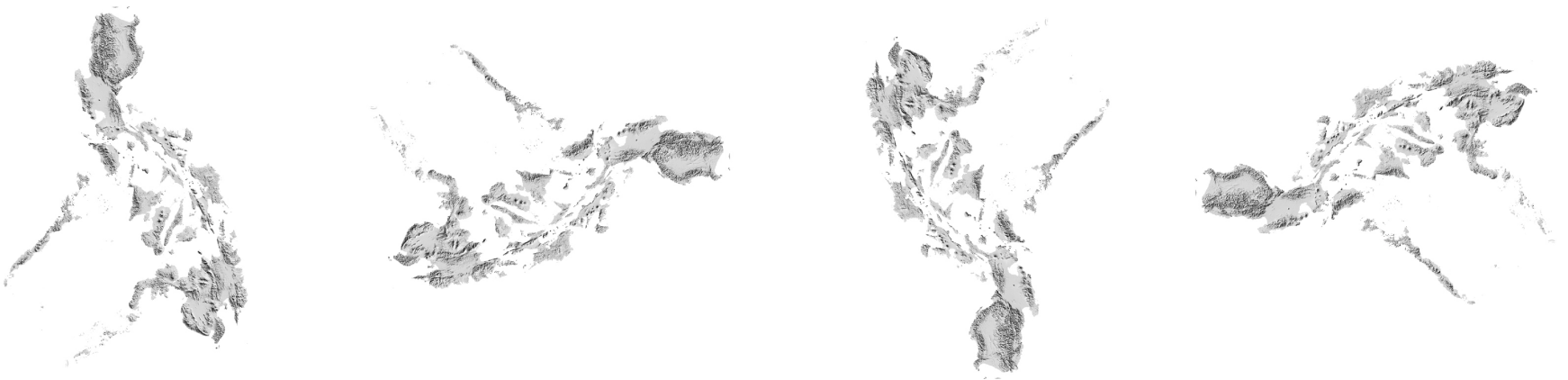
**disorientation and
reorientation**



Google Earth. Screenshots as of 16 July 2013.

**disorientation and
reorientation**

TO REFRESH YOUR VIEW OF THE PHILIPPINES,
DISREGARD TRADITIONAL DIRECTIONS (NORTH, SOUTH, EAST, AND WEST)
AND TRY VIEWING IT IN DIFFERENT WAYS.



HOW YOU SEE IS AS IMPORTANT AS WHAT IS SEEN.

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Google Earth. Screenshots as of 16 July 2013.

**disorientation and
reorientation**



Google Earth. Screenshots as of 16 July 2013.

**disorientation and
reorientation**

CRITICAL APPROACHES

Integration

Maps evoke and express imagination and intention.

Maps are power tools.

Maps always lie.

Maps record resources and are resource in themselves.

CRITICAL APPROACHES: CONTEXTS

Geographic Information Systems is an annual multibillion-dollar industry and is therefore subject to the demands for profit which leads to the service of particular interests of those who can afford to commission digital mapping.

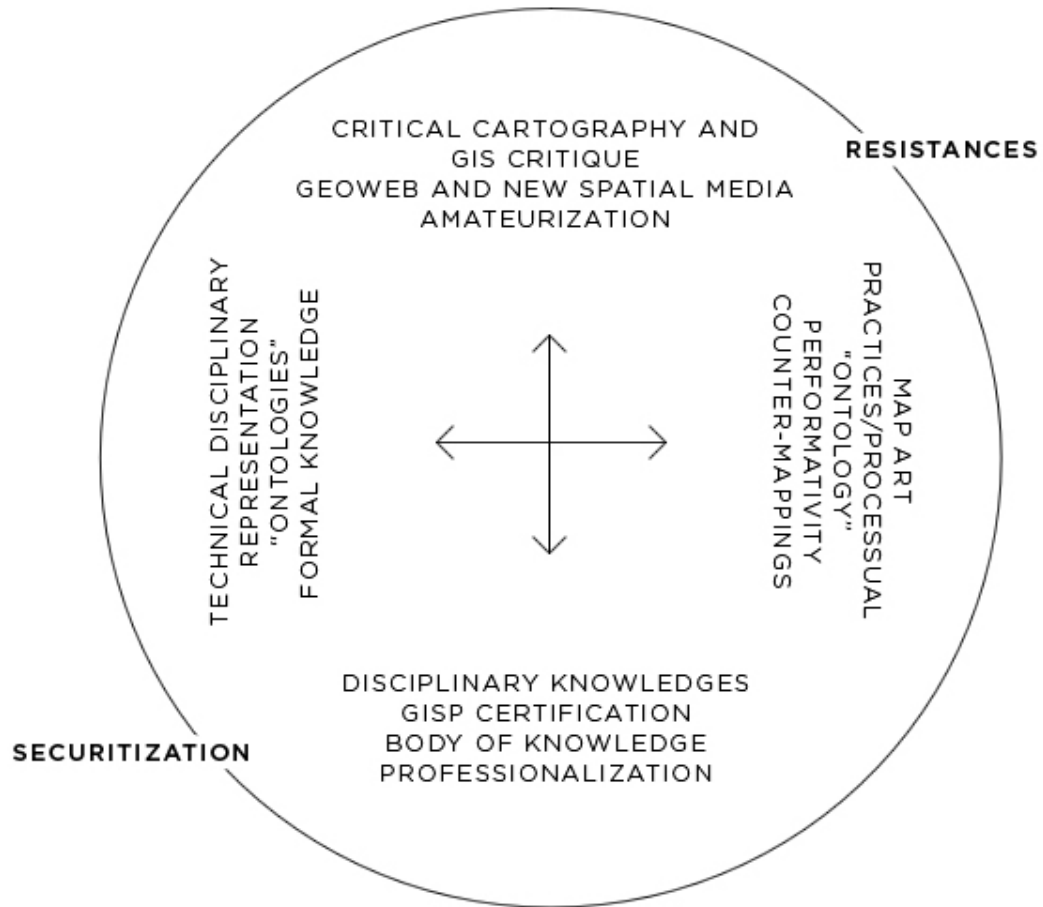
With regards to culture, what is deemed important by the mappers and map users are what are depicted and seen in maps. Other features are intentionally left out or are simply ignored.

CRITICAL APPROACHES: CONTEXTS

Every activity that is either map making, distribution, interpretation, study, or a combination of anything above can be plotted in a conceptual framework that is characterized by securitization and resistance. Securitization in mapping involves the legitimization of the knowledge represented in maps and efforts to mainstream and standardize things related to cartography. Resistance in mapping are efforts that question the implications, purposes, and effects of mapping-related activities and products – even mapping itself.

Such securitization and resistance comprises a expanding sphere of where mapping and map-related activities and things are – a field of tension.

THE FIELD OF TENSION IN MAPPING
BY JEREMY CRAMPTON



CRITICAL APPROACHES: REPRODUCTION OF GEOGRAPHIC KNOWLEDGE

The reproduction geographic knowledge and the power that comes with such knowledge in this age of the Internet and telecommunications is uneven. GIS technology is but reserved for those with internet access and much finance is needed to update maps. Also, maps portray socially accepted norms of spatial representation, especially those of the dominant groups. Dominions of indigenous communities are but absorbed inside administrative boundaries. Such selective awareness of geographical reality help perpetuate social norms.

CRITICAL APPROACHES: INTERPRETATION OF GEOGRAPHIC KNOWLEDGE

Even though maps are purposed to convey a particular message, map readers of different backgrounds, attitudes, knowledge, and behavior may interpret a map in a way that is divergent from the original intended message. Such differences of interpretation may also be due to place or time differences. A racial map of Europe made in the early 20th century may be interpreted as unduly racist wherein the original meaning of race in such map may be just a classification according to speech.

CRITICAL APPROACHES: INTERPRETATION OF GEOGRAPHIC KNOWLEDGE

Intertextuality is a primary concern in interpretation. It is a characteristic of maps that embeds the map within an interpretation process in which users use a variety of experiences and attitudes.. Intertextuality implies that users do not interpret a map just based not only on its symbols, colors, and layout but also using attitudes and geographical knowledge from experience with travel, photographs, and other media.

intertextuality

A characteristic of maps that embeds the map within an interpretation process in which users use a variety of experiences and attitudes.

CRITICAL APPROACHES: USES AND EFFECTS OF MAPS

Critical treatments of maps make cartography seem sinister. Yet it is also possible that maps can be catalysts of acceptable social benefits.

Maps inform us of where we are, where we are going, and what we have. Maps can help settle territorial disputes and mark possible places of potential sustainable development. Withal, such potentials need to be taken with a grain of salt; maps are both good and bad, depending on the context.

CRITICAL APPROACHES: CARTOGRAPHIC ANXIETY

Cartographers – whether makers or scholars – are thus caught in a schizophrenic situation in which maps are seen as having a two-edged potential. GPS and GIS are tools of war yet they are also used for navigation and precise location of infrastructure and residential construction.

Standardized symbols facilitate the communication of geographic information across cultures but social groups from remote settlements may not be readily familiar with such symbols. Such paradoxes create in cartographers something that is called by Jeremy Crampton cartographic anxiety.

CRITICAL APPROACHES

Politics and ideology

Map Monsters

Prejudice

Map as symbol of state

Generalization

Blunders

Maps that advertise

Disorientation and reorientation

Integration

Maps evoke and express imagination and intention.

Maps are power tools.

Maps always lie.

Maps record resources and are resource in themselves.

IN OUR CURRENT
SITUATION IN METRO
MANILA, WHAT
SHOULD BE THE ROLE
OF **MAPPING AND
MAPPERS?**

REFERENCES

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