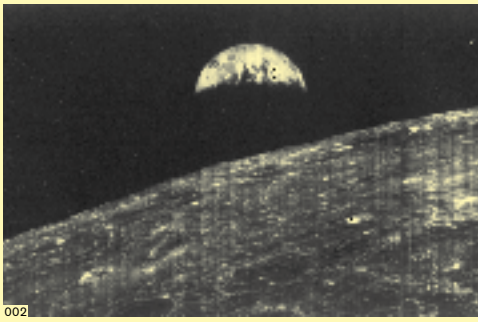
SCALES OF THE EARTH

NEW GEOGRAPHIES 4

TOWARD A PLASTIC CONCEPTION OF SCALE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In recent scientific and technological research, the concept of scale has been addressed using two main approaches. On one hand, scale is presented as an ontological fact that organizes matter in a Russian-doll structure from the infinitely small to the infinitely large. On the other hand, scale is posited as a methodological tool that manages data within a defined spatial frame to access an extracted section of reality. These approaches, however, have proved either overwhelming and thus useless, or reductive and therefore biased in their representation of the world and social relations within it.

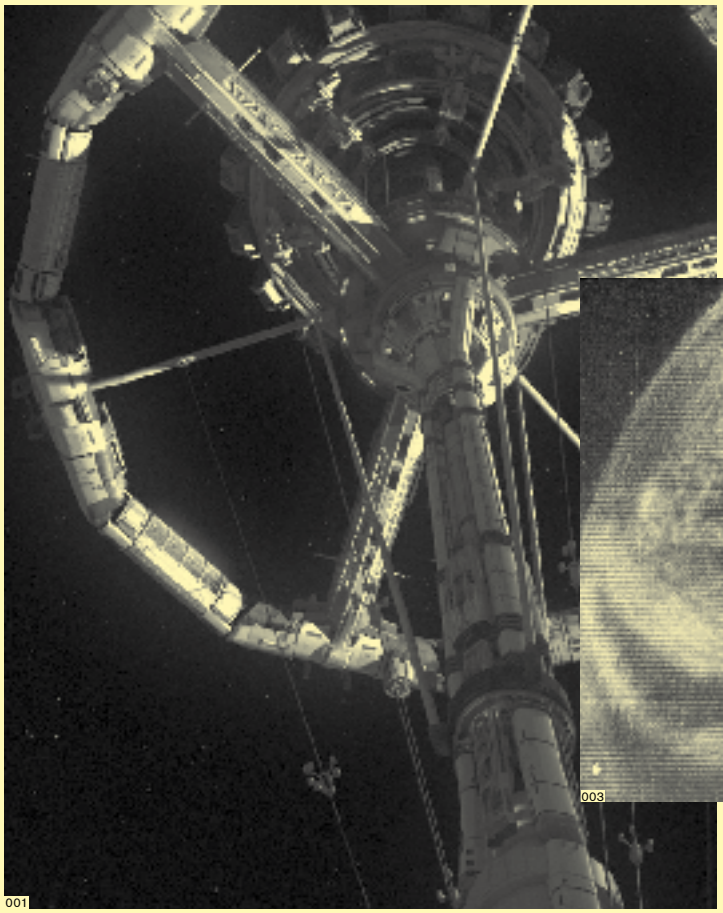
Scale is neither a given fact nor an imposed methodological frame. Contrary to what Google Earth and other representational tools seem to imply, things are not only related in a zoom-in, zoom-out manner. Scale is not transparent and space does not exist simultaneously across scales.

In the twentieth century, conventional city-frame analysis of urbanization proposed a narrow view of the development of urban regions. This way of looking at Brussels, for example, shows the hollowing out of the center to the benefit of the suburbs. A broader examination of the city, however, within the complex of Antwerp and Ghent – or what has been termed the BAG Flemish Diamond – highlights that this network of megapolises has actually become denser and attracted economic activities and population flows from the larger region of northern Europe. In this case, Brussels, within BAG, appears as an extraordinary centralization of activity.

To overcome the limitations of both the Russian-doll and the detached spatial-frame approaches, volume 4 of New Geographies advances the concept of the plasticity of scale to highlight that a geographic scale has the propensity to undergo deformations given certain dynamics. Scale is not a fixed environment within which events unfold; rather, it is the unfolding of events that produces a certain scale. Scale is a tool to understand relationships, negotiations, and tensions between actors in space. It is plastic because it is a network of dynamic relationships that expands and contracts through the interaction of objects and people. For example, the iconic Euralille project has recast the relations of this city to other European centers, not only in terms of physical distance but also in relation to a regional political project and economic infrastructure. A malleable map of Europe that deforms geographical distances between Lille and other European cities to reflect the impact of high-speed rail exemplifies the plasticity of the European scale.

In particular, Scales of the Earth proposes to address representations of "one-world" through the notion of plastic scale as an alternative to homogenizing assumptions about global space. Globalization discourse tends to be subsumed under the two conventional approaches to scale described earlier; a plastic conception of scale, in contrast, would offer unexplored opportunities to design the Earth through a careful mapping of the relationships (continuities and discontinuities) between people and objects. Rather than approaching scale under the banner of the global, Scales of the Earth seeks to focus on the material and spatial underpinnings of scale, whose implications are yet to be fully elaborated, to achieve an effective design approach.

– El Hadi Jazairy
Editor-in-Chief, Scales of the Earth, New Geographies 4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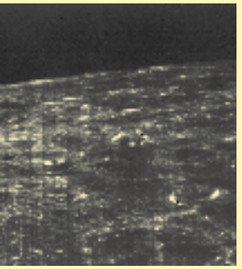


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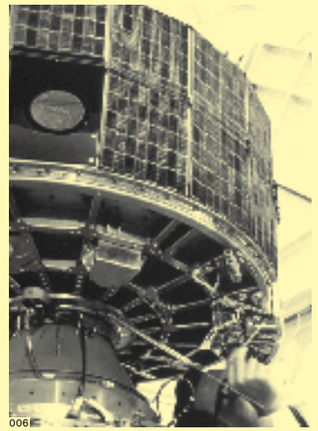
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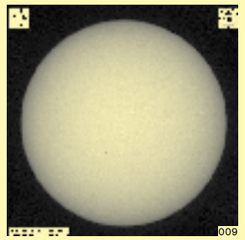
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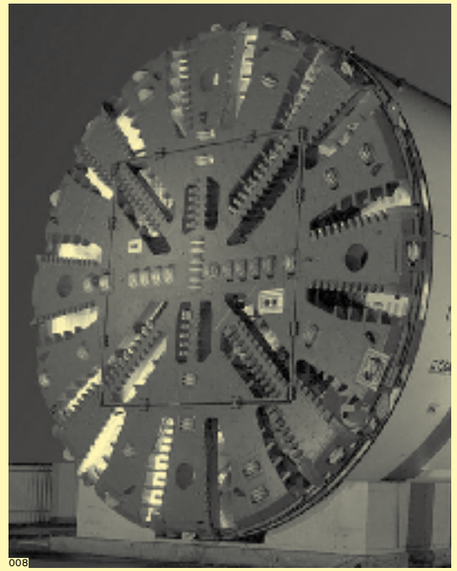
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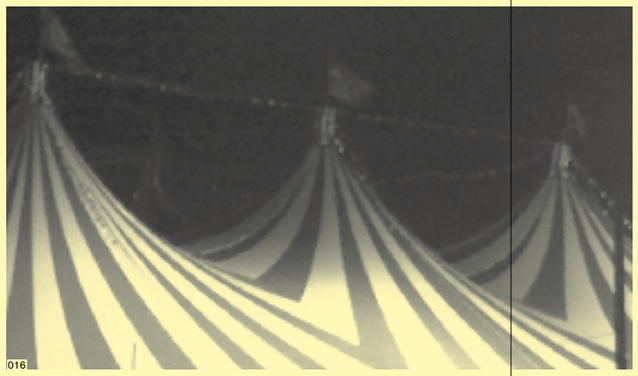
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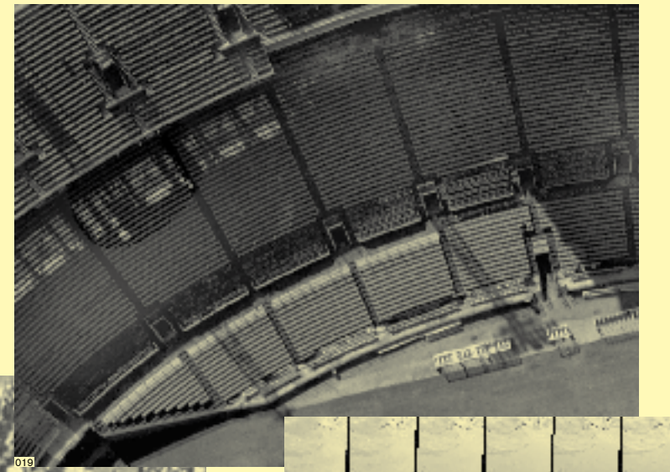
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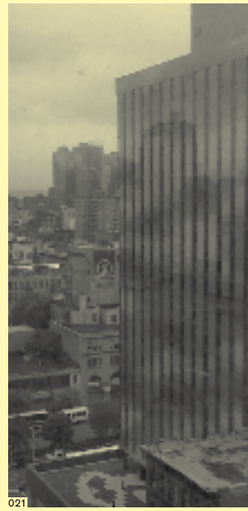
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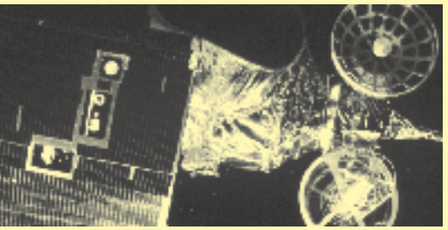

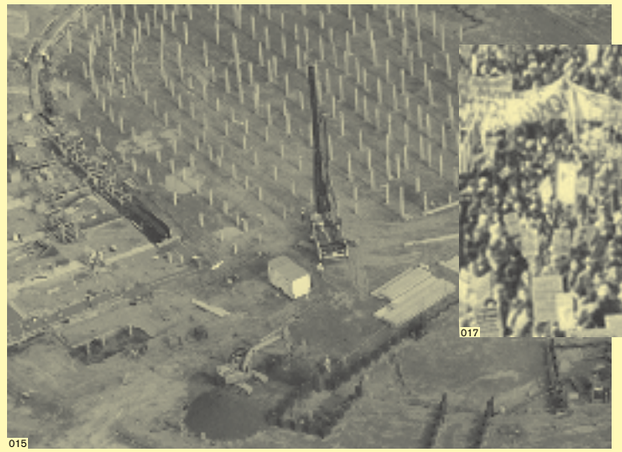
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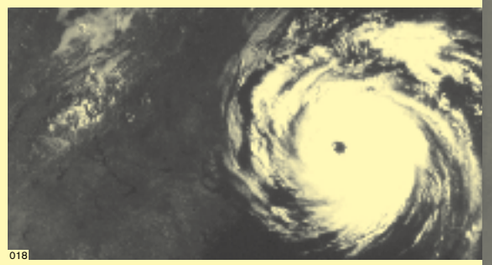
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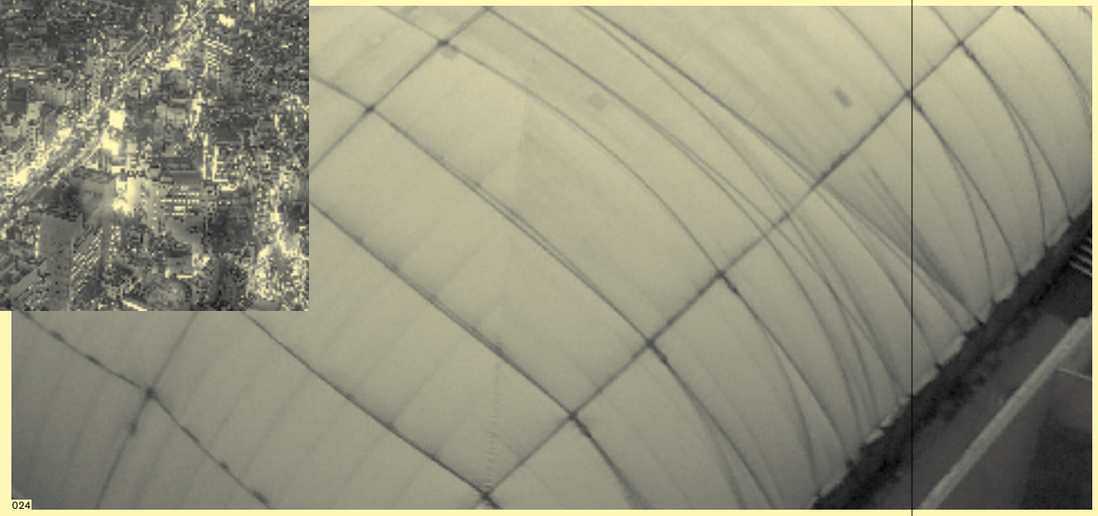
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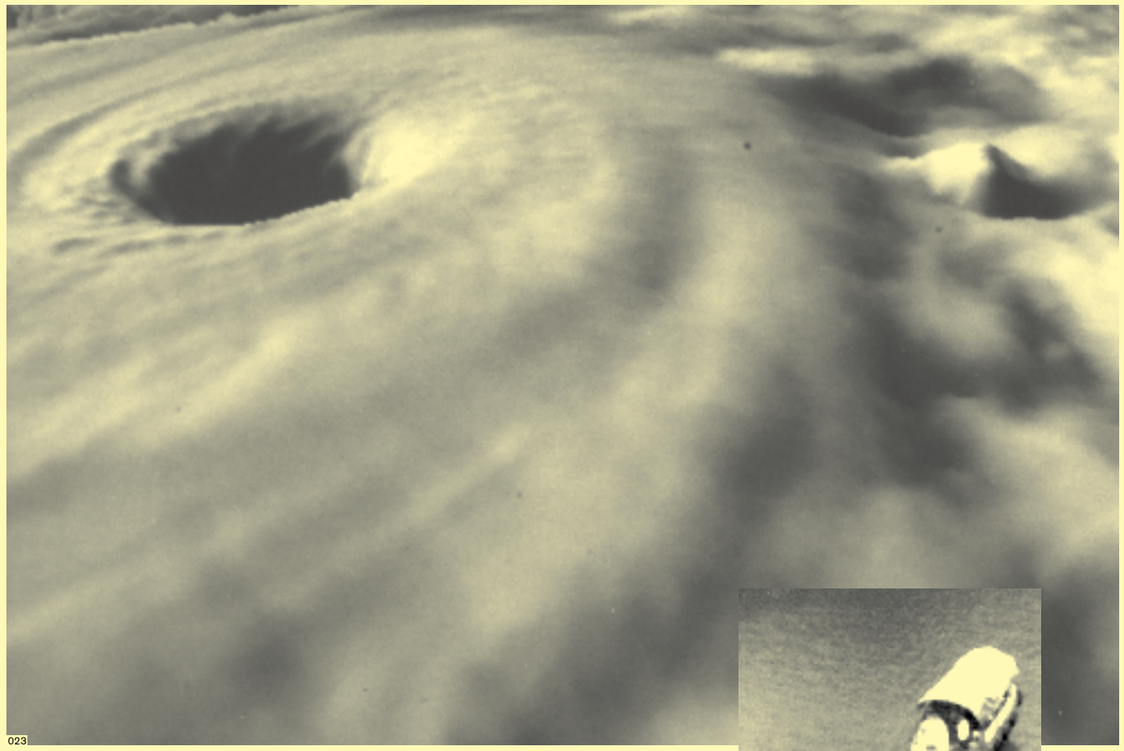
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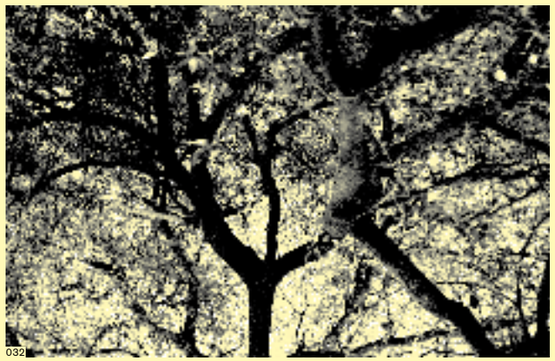
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Established in 2003, the main aim of the Aga Khan Program at the GSD is to study the impact of development on the shaping of landscapes, cities, and regional territories in the Muslim world and to generate the means by which design at this scale could be improved. The program focuses on the emerging phenomena that characterize these settings and on issues related to the design of public spaces and landscapes, environmental concerns, and land use and territorial settlement patterns. The process entails a study of their current conditions, their recent history (from World War II to the present), and, most important, the exploration of appropriate design approaches.

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JACK DANGERMOND FOUNDED ESRI IN 1969 WITH A VISION THAT GIS-BASED ANALYSIS COULD TRANSFORM PLANNING AND ENVIRONMENTAL STUDIES. DANGERMOND GRADUATED WITH A B.S. IN LANDSCAPE ARCHITECTURE FROM CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA AND A MASTER OF ARCHITECTURE DEGREE FROM THE UNIVERSITY OF MINNESOTA. HE WAS ALSO AWARDED A MASTER OF SCIENCE DEGREE IN LANDSCAPE ARCHITECTURE FROM HARVARD UNIVERSITY'S GRADUATE SCHOOL OF DESIGN, WHERE HE WORKED IN THE LABORATORY FOR COMPUTER GRAPHICS AND SPATIAL DESIGN. HE IS ALSO THE RECIPIENT OF TEN HONORARY DOCTORATE DEGREES.

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GEOGRAPHY BY DESIGN

JACK DANGERMOND INTERVIEWED BY EL HADI JAZAIRY

1. In what ways have geographic information systems had an impact on modes of representation and the operative conceptions of geography and places?

In the computing industry, we look at the legend of Xerox PARC with great admiration. Xerox PARC is where many of the most important innovations in information technology got started. In the geospatial industry, Harvard's Laboratory of Computer Graphics and Spatial Analysis is our Xerox PARC. I think that the things that happened there in the 1960s and beyond forever changed the way we view geography and place.

Geospatial technology has long impacted representation. When we first started making maps with computers at Harvard, it was certainly exciting, but the actual "character' maps we made were very crude by today's standards. Using then state-of-the-art computer mapping techniques, we were still light years behind cartographers who had worked even 500 years before us! And that was a bit frustrating. As geospatial technology advanced, our ability to produce decent-looking maps with computers progressed. In my opinion, it's only recently that computer-based cartography has begun to match or even rival the best "manual" cartography.

To me, the exciting part is not just that computer-based cartography is finally approaching and in some ways exceeded the quality of manual cartography; it's what the future holds in store. Ultimately we don't simply replace paper-and-ink-based maps with maps on computer screens, but we evolve and extend the definition of what a "map" is.

Some of this is already going on today. Beyond the traditional "map," new visualization applications such as Google Earth, Bing Maps, and ArcGIS Explorer have fundamentally changed the way we interact with geography and place. When Stewart Brand lobbied NASA to release the first photograph of earth taken from space, he knew the impact that photograph would have in changing the way we viewed our environment and our relationship with it. Today, anyone with Internet access can get a similar view of the earth, then quickly zoom in to the level of their city, their neighborhood, their house, and even personalize their map with information such as videos and photos, etc. This universal access to geographic knowledge revolutionizes our ability to understand how our world works physically, biologically, and culturally, and mass personalization makes the map relevant to everyone. But who knows how much more our concept of a "map" will evolve in the next twenty, thirty, or fifty years?

And of course GIS is so much more than using computers to automate and customize map products. The technology can be used in many different ways. Much of what distinguishes GIS today and provides exceptional value to users is the ability to perform analysis. The capability to use GIS to ask complex questions related to place and answer them with geographic science has also dramatically changed the way we interact with geography and place.

The ability make rational decisions supported by sound science is crucial today, as our world becomes increasingly complicated and the problems we face become more ominous. And because of accelerating time scales, decisions are not only more complex but need to be made more quickly; and decision-making is becoming more iterative, or "agile", to borrow one of the popular terms of the day. So how do you make better decisions, given that the world is so much more complicated, and your time scale for acting is highly compressed?

One way to get through this is to use decision-support tools, such as GIS – tools that can automate decision-making, suggest courses of action, or at the very least simply organize and structure information in such a way that it is more actionable – making it easier for us to act on because in a sense it has been "pre-processed" by GIS.

2. How do you think that such tools may redefine the practices of architects as they conceive of the geographic as a possible scale, site of intervention, and design approach?

Maps are abstractions of place. So are aerial or satellite images, but imagery is different – I think that for the majority of people today, there is a more instantaneous connection with an image. GIS has already proven successful as a research tool and for performing project work. The big growth opportunity for all of us is for the technology to reach out to "everyone," and we are on the cusp of that happening. As geospatial technology reaches more people, it puts more emphasis on something we've known for a long time: that the transition from paper maps to digital maps makes us rethink "scale."

In a traditional cartographic sense, scale – the relationship between a distance on the map and the actual distance it represents on the ground – is a measure of accuracy. The idea of scale becomes a little abstracted when we move from paper maps (which are static in scale) to digital maps (which are dynamic in scale). Think of a printed map of a city that you used to use for navigation, before in-vehicle GPS devices became so prevalent. It was printed at a certain scale. With computer-based visualization of geographic knowledge, scale is of course dynamic. If you are planning to drive 2,000 miles to visit a relative, the old-fashioned method was to use multiple maps at different scales to get you where you were going – maybe a road atlas to navigate the highways to get you from your city to the destination city, then a more detailed map of the city to get you closer to your specific destination, and then probably a finer map or even some handwritten directions to get you to the exact house. Now, with your GPS, instead of juggling between three different maps, you're presented with a unified experience that scales dynamically when appropriate.

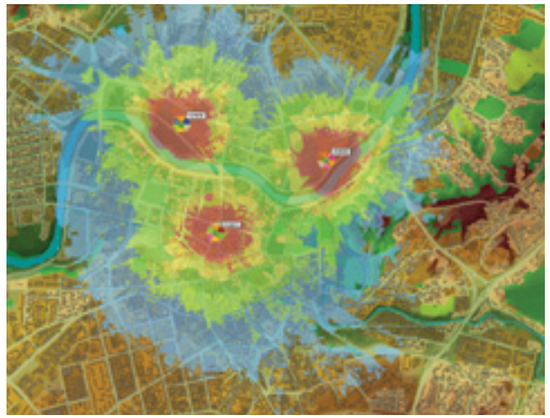
Our sense of scale has changed due to advances in technology, and it's something we need to think a lot about when distributing geographic knowledge to "everyone." And we, the geospatial professionals, need to think about that because to the average person accessing geospatial data on a cell phone, scale means nothing unless it is done wrong and causes them problems.

Scale is a type of measurement; you can almost think of it as a "rating" of the data, a rating that acts as a guide to how you can use that data and what situations you can use it in. With digital tools, information collected at one scale can now be quickly and easily displayed at another scale. This can result in obvious issues like pixilation during visualization, but it can also have more important implications, such as inaccurate analysis.

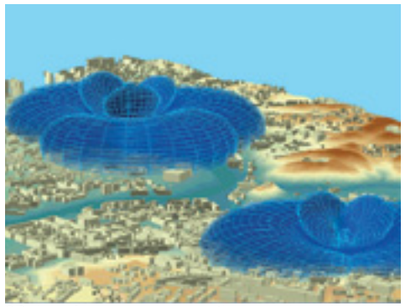
We can approach this with techniques such as scale-dependent display, but it really goes a lot further – such as, is the data itself appropriate for this use? Is the intended audience likely to interpret this correctly, and make sound decisions based on it? If not, can I alter the display, analysis, or user experience to ensure it is used properly?

3. What are the characteristics of such an integrated elevated vision, and what geographical knowledge does it bring forth?

Over the last ten years, we've seen a fundamental change in the way GIS is delivered and used, thanks to the Internet. The next ten



Visualization of cellular phone coverage using ESRI's ArcGIS Desktop with the Spatial Analyst and 3D Analyst extensions, and HNIT-BALTIC Cellular Expert extension. Copyright 2009 HNIT-BALTIC, UAB. All rights reserved.



3D view of radio wave propagation modeling using ESRI's ArcGIS Desktop with the 3D Analyst extension and HNIT-BALTIC Cellular Expert extension. Copyright 2009 HNIT-BALTIC, UAB. All rights reserved.

years will see an explosion of faster, more powerful mobile devices, and the line dividing cell phones and personal computers will fade. Mobile devices will continue to grow to support more geospatial functionality, and they will easily connect to GIS systems around the world to use and also create geographic knowledge. Democratization of data – both its widespread use and its universal creation – will result in a new kind of infrastructure: a geospatial infrastructure. Over time, society will become increasingly dependent on this geospatial infrastructure, much as it has become dependent on other, more traditional forms of infrastructure such as electrical grids or highway networks.

When technology is so universally adapted that it can be considered infrastructure, people become highly dependent on it. If your electricity was turned off for a week, how would that impact your life? If all public roads and highways were closed for a month, how would you get by?

Infrastructure is the stuff that is very basic and universal to the way we live, but is often overlooked or almost invisible because it is taken for granted. There's a lot of activity and money spent to build, operate, and maintain this infrastructure, but these activities pale in comparison to the actual use of the infrastructure. You flip a light switch, and the light comes on – you don't need to know the complexities of how the electricity was created and transmitted to your house. I think that's where we are heading with this geographic knowledge infrastructure.

GIS is the technology we have come to rely on to build, operate, and maintain this geographic knowledge infrastructure. In-car navigation applications are probably the furthest along in this regard – as far as geographic knowledge becoming infrastructure. People are becoming increasingly dependent on GPS to get them from point A to point B. I think this is just the tip of the iceberg. As location becomes a core component of more applications we use every day, our dependency on this infrastructure will increase exponentially. And that puts an increased level of responsibility on geospatial professionals who build, operate, and maintain this infrastructure.

Mobile and location-based technologies are also fundamentally changing the way we create geographic knowledge: we're seeing the widespread embracing of crowdsourcing, where the scale of data creators is greater by orders of magnitude. Crowdsourced data is data contributed by non-authoritative sources, e.g., everyday citizens. For example, there are people – volunteers – updating global base maps right now. The challenge for GIS practitioners is to ensure the usability of this data in a GIS workflow, or to turn this crowdsourced data in to useful geographic knowledge that can easily be consumed by broader segments of society. This can mean checking the "authoritativeness" of the data; it can also mean getting involved in the actual act of data collection, structuring the process to ensure that the data has meaning and is appropriate and authoritative.

GIS practitioners have long been the keepers of purely authoritative data, and are now beginning to take crowdsourced data very seriously. It gives ordinary citizens the opportunity to provide feedback directly to the government. It can significantly augment authoritative data sets at a fraction of the traditional cost. It provides extraordinary opportunities for citizen science. And it can put a virtual "army" of volunteers on a large project in short order.

4. In this data-space, which information is to be retained as relevant? What is the meaning of context? How is such an analytical space to be subsequently interpreted and experienced?

GIS tools supporting crowdsourcing will change the way organizations collect and manage spatial data. For example, new features in ESRI software give users the ability to modify geographic content within any Web mapping application and provide a venue for online communities to become active contributors to geodatabases. Web editing makes it easy to capture ideas and observations for distributed problem solving and extend GIS editing capabilities to more people within the organization. These capabilities allow everyone – from authoritative data editors to citizens on the street – to contribute content to a geodatabase. This will enrich GIS, giving GIS practitioners new types of data to use, manage, interpret, and incorporate into their work. And again I must stress that with this comes a great responsibility on the part of the geospatial professional to make sure the data is used in the correct context.

The issues we have to overcome as an industry and as a society include privacy concerns; data ownership; standards for collecting and structuring the data; and making sure we apply or analyze the data in ways that are appropriate considering the source. These are very complex issues that we need to tackle at the same time we are trying to make everything easier and available to a much broader audience. Performing spatial analysis, building a spatial data infrastructure… these are difficult, complicated tasks, and they will remain so. In a way, one of our primary responsibilities as geospatial professionals is to hide the complexity. Obviously the capabilities available to a GIS professional or a city planner are going to be very different than those available to a citizen with a cell phone. We need to determine what geographic knowledge is relevant for a given situation, or for a particular audience, and build our applications around that knowledge.

5. Is it fair to think of geography as an objective and universalist field of study? What are the cultural, political, and environmental repercussions of new ways to organize and evaluate potentially counterfactual understandings?

I think that change is inevitable, and not being prepared for change is shortsighted and irresponsible. Many of the things the GIS community is working on – new tools for spatial analysis, for example, or adapting our technology to new platforms such as mobile devices or leveraging new methods such as crowdsourcing – could potentially have huge social or environmental effects, both positive and negative, and this is a responsibility we cannot take lightly.

David Harvey said, "geography is too important to be left to geographers." The combination of increased availability of geographic knowledge and easier access through mobile computers really opens up the use of geographic knowledge to everyone. But that doesn't mean that geographers are no longer relevant. In fact, I think that making geographic knowledge available to the masses means that you need even more geographers.

People already understand maps, and as I said earlier, our definition of "map" is evolving quickly along with the technology. But the map is still our best method for dissemination of geographic knowledge. And when people place all of this new geographic knowledge on a personalized map, and they see environmental problems or economic issues in the context of their neighborhood, their street, their house – this leads to a new level of understanding. They get it, right away. So the ability to take all of this data and put it in context on a dynamic, personalized map is very powerful.

Speaking about ESRI in particular, the company was founded as a socially and environmentally conscious organization. In other words; the company was founded precisely because we thought that GIS technology could be used to positively impact society and the environment – to make the world a better place.

More people using geographic knowledge will result in more highly evolved interfaces. But we must be extremely careful here. Information can so easily be misused. As we get even more information, and make it easily available to so many people, the opportunities for misuse increase exponentially. Even highly trained scientists make mistakes with data, as we've seen – imagine the possibilities for misinterpretation of critical environmental or social data in the hands of an average cell-phone user, who is not trained in things like the scientific method, statistical analysis, etc. I'm not saying that this democratization of geographic knowledge is a bad thing; it's a wonderful thing, and it's something I've personally been wanting for a long time. But our approach needs to be deliberate; we need to deliver the appropriate knowledge, to the right people at the right time, but also we need to package it in a way that gives the best opportunity for correct use and interpretation.

6. What new global issues and debates do such scales of vision raise and how do such visualizations of the Earth-as-home intersect with concerns of ecology and calls for global awareness?

The two big, global issues in my mind are climate change and GeoDesign.

I like to say that climate change is a geographic problem. It's a difficult, complex, politically charged, and vitally important issue. Yet from a knowledge perspective, we are at a distinct disadvantage: at this point in time, we still do not have a clear idea of everything we need to know in order to address the problem in a measured, rational, and above all, scientific manner.

When you think about the multitude of issues surrounding climate change science – from root causes to resultant impacts – geography is clearly an elemental factor in the equation. Every aspect of climate change affects or is affected by geography, be it at a global, regional, or local level. As a tool for helping us to better understand such geographies, GIS is the single most powerful integrating tool for inventorying, analyzing, and ultimately managing this extremely complex problem.

For the last several years, I've been very interested in the idea of GeoDesign – a marriage of design with the analytic power of GIS to create a powerful new environment characterized by fast iterations and public participation, all supported by a solid scientific base.

Maps are a way to abstract place to make it easier to understand. With GeoDesign, we move beyond understanding place, to designing it. "Where should we locate this new factory?" becomes "How, when, and where can we best achieve the goals of building a new factory within the surrounding environment?" Design should be guided by geographic knowledge. And who's a designer? In a way, we are all designers. Most of us just don't realize it. And we need to get better at it. That doesn't mean we all have to go back to school and study design. But we need a way to integrate design concepts in to what we already do. GeoDesign will give all of us access to better tools to make better design decision.

GeoDesign is a set of methods and tools that allow us to sketch and quickly consider the consequences of alternatives. Just like we navigate to work this way instead of that way, which is a kind of design problem, we'll design the future so it's sustainable, so that it considers all of our geographic knowledge. I want to make this concept of GeoDesign pervasive so people start to make decisions that are based on geographic knowledge. Our future depends on this. Putting geographic knowledge in the hands of everybody, and then giving them the GeoDesign tools that let them design in consideration of all that geographic knowledge is, I think, an important step in human evolution.

7. How do you see the latest concerns of geographic information systems relating to Ian McHarg's initial concepts of designing with nature?

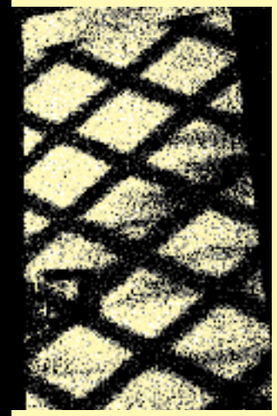
GIS has never strayed too far from McHarg's initial concepts of environmental conservation and using a methodology to do rational planning, taking environmental factors into consideration. Most geospatial professionals clearly understand the notion of map overlay, or polygon processing, having its roots with McHarg's work and being the base theory behind GIS.

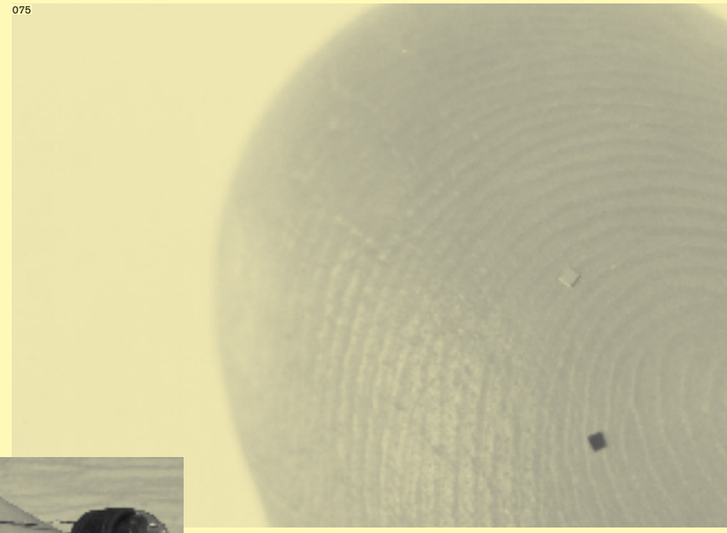
GeoDesign is an extension of McHarg's original vision. Or maybe it's just a modern interpretation of McHarg's vision; it's GIS getting "back to its roots." GIS can be used for so many different purposes and for many more applications than McHarg originally envisioned. The technology is making a difference everywhere, and all of those applications have made the technology stronger and better. But I think that maybe we lost a little of our focus for a while, and GeoDesign is an attempt to bring that focus back and apply the technology to McHarg's vision of designing with nature.

We rarely talk of McHarg without mentioning overlays; the two are often synonymous. Yet usually overlooked in discussions of McHarg's influence on environmental planning and geospatial analysis is the concept of chronology. When looking at geographic overlays of different aspects of a project – comparing them, analyzing them, looking for relationships – McHarg was very interested in the temporal dependencies, or chronology. Causal relationships in geography can sometimes be easily overlooked if time is not taken in to consideration. Placing the overlays in time sequence, as McHarg suggested, can lead to a deeper understanding of structure and meaning in the landscape.

At ESRI, we are putting much effort in to rebuilding our GIS technology to not only handle space but also time – we're adding a robust capability to store and manage temporal data, and we're also working on temporal analysis tools. Adding time capabilities to the equation makes GIS and GeoDesign more comprehensive, moving us closer to a complete system for "designing with nature." And from a GeoDesign perspective, once we have the tools and techniques in place to fully grasp how the past has created the present, we can apply these same tools and techniques to shape our future in a more socially and environmentally responsible manner.

Alan Kay said, "the best way to predict the future is to invent it." GIS has been very focused on analysis and modeling, often in an attempt to "predict the future," which is always difficult. With GeoDesign, we're moving beyond trying to predict the future and toward a mindset where the future can be invented or created in a logical, scientific, and purposeful manner. Carl Steinitz has said: "GeoDesign is geography by design." We're moving beyond a world composed primarily of what you can consider "accidental" geography – things located in a certain place because certain seemingly unrelated decisions were made two, or ten, or twenty-five generations ago. Part of the GeoDesign concept is an up-front understanding of the long-term consequences of our design on society and the environment. That's one big thing we've been lacking.





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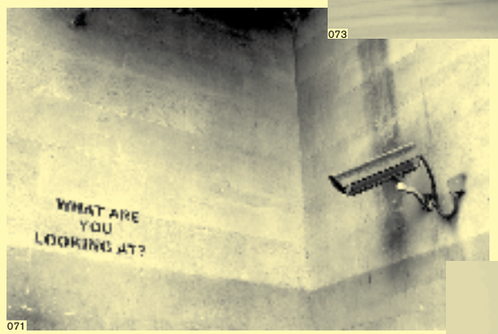

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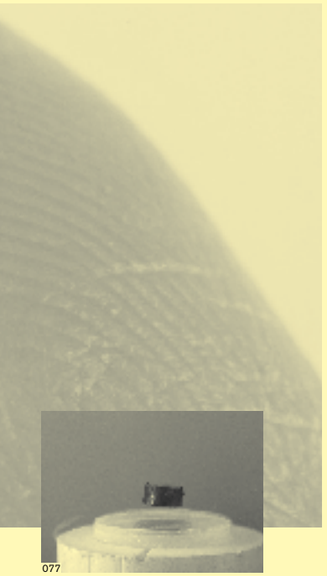
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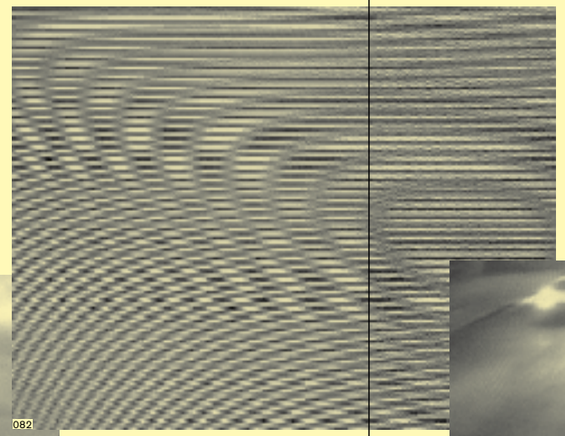
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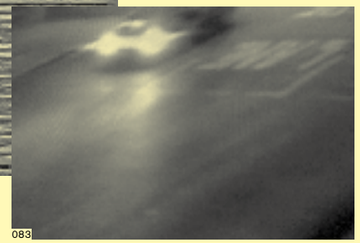
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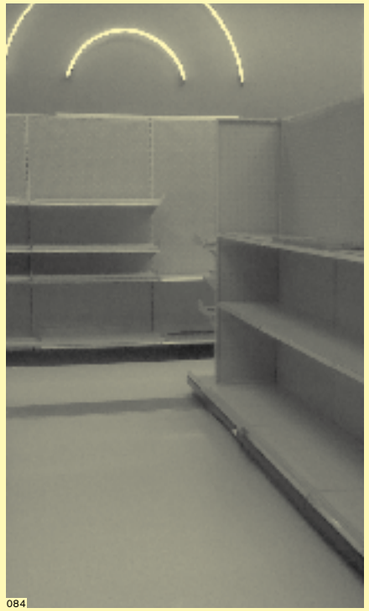
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