LEV MANOVICH,
"Introduction to Info-Aesthetics" (2008)

THE PROBLEM

I would like to introduce a new paradigm for understanding contemporary culture: info-aesthetics. Unlike concepts such as modernism or postmodernism, this paradigm does not aim to be all-inclusive. In other words, I do not have the ambition to understand all new features of contemporary culture as manifestations of a single logic, or a small set of principles. Nevertheless, as I will try to show in my forthcoming book *Info-aesthetics: Information and Form*, if we adopt an info-aesthetics filter, this will allow us to relate together a wide range of cultural phenomena, including some of the most interesting and important projects in a variety of areas of contemporary culture: cinema, architecture, product design, fashion, Web design, interface design, visual art, information architecture, and, of course, new media art. So while info-aesthetics should not be the only tool you would want in your conceptual toolbox, it comes in very handy. This essay, then, may be read as an introduction to the future book and, at the same time, a summary of some of the key ideas of the info-aesthetics project that has preoccupied me since 2000.

To explain what I mean by info-aesthetics, let me start by noting something simple but nevertheless quite significant: the word "information" contains within it the word "form." For some time now social theorists, economists, and politicians have been telling us that we are living in a new "information society." The term was first used in the 1960s, even before the computer revolution got under way. I will discuss below certain theories of information society, as well as related concepts of postindustrial society, knowledge society, and network society. Since this project is about the culture of information society, the arguments of economists and sociologists are no more important than the changes in people's everyday lives. What we do, what objects we use, how we communicate and interact with others and the kind of spaces we dwell in or pass through—all this is bound to change existing cultural patterns and aesthetic preferences as well as create new ones. The fact that we can observe significant changes in all these dimensions of everyday human experience, and that they are converging around "information," requires us to explore corresponding cultural responses.

When the term "information society" was first introduced in the 1960s, few people, even in the United States, had ever seen a computer. (In my own case, having grown up in Moscow in the 1970s, I came face to face with a working computer only after I came to New York in 1981.) Of course, a few perceptive artists such as Jean-Luc Godard in his brilliant *Alphaville* had already understood that the computer was becoming a new god of our times, but they were exceptions. Even such a visionary as Marshall McLuhan—who seemed to predict with precision most features of contemporary cyberculture about three decades before they came into existence—ignored computers. In *Understanding Media* (1964), which presents a systematic analysis of all key historical and modern media technologies, McLuhan does devote the very last section to data processing, but in general computation plays no role in his theories. This is so, probably, because McLuhan was thinking of media as above all a means of communication and/or representation. In the 1960s computers were not yet involved in any of these functions in a way that would be visible to the public.

If in that decade only a very small number of computer scientists—Ted Nelson, Alan Kay, and a few others—understood that the computer was bound to become an engine of culture rather than remain merely a data-processing machine, similarly, only a few social scientists were able to perceive that dealing with information was replacing industrial manufacturing in importance. Today, however, what was once an academic hypothesis has became an everyday reality that can be easily Observed by the majority of citizens living in the developed and the developing countries. All kinds of work are reduced to manipulating data on one's computer screen, that is, to the processing of information. As you walk or drive past office buildings in any city, all offices, regardless of what a company does, look the same: they are filled with rows of computer screens and keyboards. Regardless of their actual profession, financial analysts, city officials, secretaries, architects, accountants, and pretty much everybody else engaged in white-collar work are doing the same thing: processing information.

When we leave work, we do not leave information society. In our everyday life, we use search engines, we retrieve data from databases, and we rely on "personal information appliances and personal information managers." We complain that there is too much information to keep track of, to make sense of; meanwhile, libraries and museums around the world constantly add to the global information pile by systematically digitizing everything they have. We turn our own lives into an information archive by storing our emails, chats, smss (short message services), digital photos, GPS data, favorite music tracks, favorite television shows, and other "digital traces" of our existence. One day, we get tired of all this so we start planning to take "email free" holidays. But even this requires information work: for example, searching for the best deals on the Internet, comparing fares, inputting credit card information into a reservation Web site, and so forth. Even on a largely activity-free vacation, the moment we open a cell phone to make a call or check messages, we enter the world of information. In short, the "information society" is where most citizens of the developed and developing world live today, experiencing it in their everyday practice. While those living outside this world themselves are not using computers on a daily basis, the companies, NGOs, and governments of the developed countries, which play the decisive role in deciding what happens in fourth world countries, are all of course computerized. Information processing shapes the lives and fates of citizens of these countries even though they themselves may not experience it directly.

Information processing has, in these and other ways, become the key dimension of our daily lives. Yet, since we are physical beings, we have always required and continue to require various physical forms in order to house and transport our bodies, our information-processing machine, and information itself. These forms range from those that are very large (buildings, bridges, airplanes) to those that are very small (iPods, mobile phones), from the rarely changing (architecture) to the periodically updatable (clothes). Just as a person needs clothing, a computer needs a case to protect its insides and to allow us to enter and manipulate information in a convenient way (that is, a human-computer interface, typically a keyboard and a screen). Text needs to be displayed in ways suitable for us to be able to read it, be it on a screen, paper, or e-paper. Therefore, although the word "information" contains the world "form" inside it, in reality it is the other way around: in order to be useful to us, information always has to be wrapped up in some external form.

We need to design forms for ourselves, and also for information that we create, record, and manipulate. We may have become an information-processing species, but we also remain a form-creating species as well. If, for Marx, humans separated themselves from other species

when they first designed tools for work, we can add that humans became humans by becoming designers, that is to say, the inventors and makers of forms.

INFORMATION AND FORM

If information processing is the new defining characteristic of our world, what is the effect of this situation on the forms we design today? This is the question in which I have been most interested after finishing my book *The Language of New Media* in 1999. It is important to differentiate between two lines of influence in the ways information shapes the forms we design. On the one hand, we may think about how the centrality of dealing with information in our daily lives may affect our aesthetic preferences as manifested in trends in architecture, industrial design, graphic design, media design, cinema, music, fashion, theater, dance, exhibition design, and other cultural fields. On the other hand, we also need to remember that most forms we encounter today are designed on computers. This, of course, is likely to have at least as much of an effect on what forms the designers are going to come up with. In sum, information processing acts both as a force outside a form, so to speak (that is, the new habits of perception, behavior, work, and play), as well as being the very method through which the forms are designed.

There is another fundamental effect that is worth articulating immediately. In the information society the design of forms becomes intricately linked with the concept of interface. As I mentioned above, we need to give some visual form to what will appear on the screens of computers, mobile phones, PDAs (personal digital assistants), car navigation systems, and other devices-as well as to buttons, trackballs, microphones, and various other input tools. Human-computer interfaces that involve a set of visual conventions—such as folders, icons, and menus (the graphical user interface), audio conventions (as in voice recognition interface), and particular material articulations (such as the shape, color, material, and texture of a mobile phone)—represent a whole new category of forms that need to be designed today. Even more important, as computation becomes incorporated into our lived environment (a trend described by such terms as “ubiquitous computing,” “pervasive computing,” “ambient intelligence,” “context-aware environments,” “smart objects”), the interfaces slowly leave the realm where they have lived safely for a few decades (think of stand-alone computers and electronics devices) and start appearing in all kinds of objects and on all kinds of surfaces, for example, interior walls, furniture, benches, bags, clothing, and posters.[1] Consequently, the forms of all these objects that previously lived “outside of information” have now to address the likely presence of interfaces somewhere on them.

This does not mean that from now on “form follows interface.” Rather, that the two have to accommodate each other. Beyond the traditional requirements that the material forms had to satisfy—a chair has to be comfortable for sitting, for example—their design is now also shaped by new requirements. For instance, we have been accustomed to interacting with text that is presented on flat and rectangular surfaces, so if a screen is to be incorporated somewhere, a part of the object needs to be reasonably flat. Which is easy to do if an object is a table but not as easy if it is a piece of clothing or a section of Frank Gehry's Disney Hall in Los Angeles, a building that was specifically designed not to have a single flat area. Of course, given that new technologies such as rapid manufacturing may soon enable easy printing of an electronic display on any surface of any object while it is being produced, it's possible that we will be able to quickly adjust our perceptual habits, to the point that moving and shape-changing display

surfaces will be accepted much more readily than I can imagine. In fact, computer-controlled graphic projections onto the bodies of dancers, as in *Apparition* by Klaus Obermair or in the Interactive Opera Stage system by Art+Com, already show the aesthetic potential of displaying information over a changing, nonflat, nonrectangular form.[2]

October 18, 5:04 p.m.-5:33 p.m.

I am looking at the show of student projects from the Department of Industrial Design at Eindhoven Technical University in Netherlands. The department is only three years old, so instead of designing traditional objects, students are working on "smart objects." Every project in the show starts with an everyday familiar object and adds some "magical" functions to it via electronics and computers—more examples of solid objects and media/interface surfaces coming together. In one project, a canopy placed diagonally over a child's hospital bed becomes an electronic canvas. By tracking the position of a special pen that does not need to touch the drawing surface, the canvas allows the child to draw on it without having to move from the bed. In another project, a special mirror allows one person to leave a message for somebody else-for instance, a different member of a household. A rectangular block containing a camera is built into a mirror frame. You take the block out, record a video message, and place the block back into the frame. After the video is automatically "loaded" into the magical mirror, a small picture appears somewhere on the mirror surface: when you click on the picture it plays the message. Yet another project adds magical interactivity to a vertical plastic column. The lights inside the column turn it into an ambient light source. The column is covered with a special interface: a net. Depending on how you touch the net, the position, quality, and tint of the light changes. How exactly the light will change is not directly predictable, and this is what makes interaction with the light column fun.

Together, these three projects show us different ways in which an object, an interface, and a display can be put together. The first two projects rely on already familiar behaviors—drawing with a pen or making a recording with a video camera. The last one calls for the user to develop a new vocabulary of movements and gestures to which the light will respond. And the ways in which each of these "smart objects" talks back to us are also different: a canvas canopy shows a drawing, a mirror plays video, and a light glows in different ways. In short, the surface of an object can become at once an output and input medium, bringing the physical and the screen-like—that is to say, form and information—together in surprising ways. There is, indeed, magic in these "smart objects": we see familiar, usually passive objects literally coming to life and responding to our interactions with them.

Screen Forms

The forms used in design and architecture are not only material in character, but they are also ways to structure data in order to make it meaningful and useful for human users by presenting it on some kind of display. A cinematic narrative, an interactive information visualization, a Web search engine, the user interface of Nokia phones, or Spotlight (a new search/file management tool in Apple OS X) are also forms, which organize data, whether audiovisual recordings in the case of a film, or documents on a hard drive in the case of Spotlight. To distinguish these kinds of forms from the material ones, I will refer to them as "screen forms"—keeping in mind that the actual displays can also include paper (as in illustrations and graphs that appear in journals), as

well as augmented reality displays where information is seen superimposed against the real world.

Since the info-aesthetics project is about form and information, I am focusing on the new screen forms that either offer us fundamentally new ways to manage information or respond to the dramatic increase in its quantity. This last fact may appear trivial: we all know that every day fifteen thousand new blogs are created.[3] And that is not all (insert your own favorite statistic that is likely not to get completely obsolete soon). All this is familiar and therefore not very interesting; and yet our daily habits of work and entertainment, the ways in which we understand ourselves, others, and the world around us are being deeply reshaped through this purely quantitative growth of information being produced, exchanged, stored, and made available.

This is another reason why I chose the term "information society" over any other as indicating most acutely the context for this inquiry. I believe that the exponential growth of information available to us is one of the main pressure points on contemporary culture and that this pressure will only continue to increase. The cultural effects of this information glut are diverse. By situating my investigation within the context of the "information society" I want to highlight a new cultural dimension that so far has not been part of our critical vocabulary: scale. In other words, while normally we think of culture using qualitatively different categories such as authorship, collaboration, reception, media type, ideology, and so on, we also now need to start considering something purely *quantitative*: the dramatic increase in the amount of media available. We no longer deal with "old media" or "new media." We now have to think through what it means to be living with "more media."

Some effects of this quantitative change are already visible. Our new standard interface to culture is a search engine. Although by now we have become completely used to this, imagine your reaction in the early 1990s if somebody had told you that soon, if you wished to access information, you would first search through millions of documents, and only then begin listening, watching, or reading. A related development is the shift from a single media object—usually one that physically existed as an entity and was appreciated in isolation—to a sequence or a database of digital media. For instance, rather than fetishizing a particular physical music record or a particular photographic print, we now deal with music playlists or catalogues of digital photographs.

But what do these effects mean? Will the increase in the amount of available mediums, and the advent of new tools and conventions used to access them, lead to a new aesthetics in artworks themselves and to new patterns in their reception? These kinds of question are much harder to answer. There are some new cultural practices, even new fields, that address the exponential growth in the quantity of information in creative ways. I see this growth of information not as a cultural threat but as an opportunity. New cultural strategies are often invented as a response to a real social crisis or simply a perceived change in social order. Industrialization during the nineteenth century provoked a number of creative responses such Art Nouveau and the Arts and Crafts movement. World War I and revolutionary fever in Europe led to Constructivism, the development of the Russian montage school in cinema and photomontage, Surrealism, and so on. Today, "informationalization" puts pressure on society to invent new ways to interact with information, new ways to make sense of it, and new ways to represent it. Social software such as Wikipedia, work in information visualization and information design such as the projects by Benjamin Fry, exceptional database narratives such as *Bleeding Through: Layers of Los Angeles* by Norman Klein, Rosemary Camella, and Andreas Kratky, and cultural analysis such as *Rhythm Science* by DJ Spooky are all examples of approaching the new

information environment creatively. Instead of trying to defend ourselves against an information glut, we need to approach this situation as an opportunity to invent new forms appropriate for our world. In short, we need to invent info-aesthetics.

METHOD

I began by observing that the word "information," which defines our era, contains within it the word "form." What are these forms? Or, to put this differently: what is "the shape of information"?

This formulation may sound cute but not in itself informative. Let me, therefore, unfold it into a set of more specific questions. Has the arrival of information society been accompanied by a new vocabulary of forms, new design aesthetics, new iconologies? Can there be forms specific to information society, given that software and computer networks redefine the very concept of form? After all, instead of being solid, stable, finite, discrete, and limited in space and time, the new forms are often variable, emergent, distributed, and not directly observable. Can information society be represented iconically, if the activities that define it-information processing, interaction between a human and a computer, telecommunication, networking-are all dynamic processes? How can the superhuman scale of our information structures—from sixteen million lines of computer code making Windows OS, to the forty years it would take one viewer to watch all the video interviews stored on the digital servers of the Shoah Foundation, to the Web itself, which cannot even be mapped as a whole—be translated to the scale of human perception and cognition? In short, if the shift from industrial to information society has been accompanied by a shift from form to information flows, can we still map these information flows into forms meaningful to a human?

When I started looking at contemporary culture from the perspective of these questions, I decided that I needed a term to label my future findings. I adopted "info-aesthetics" as this term. The info-aesthetics project scans contemporary culture to detect emerging aesthetics and cultural forms specific to a global information society. I do not want to suggest that there is some single "info-aesthetics style" that already exists today or may emerge in the future. Rather, "info-aesthetics" refers to those contemporary cultural practices that can be best understood as responses to the new priorities of information society: making sense of information, working with information, producing knowledge from information. While I think that these practices already occupy a prominent place, and that it is one that will steadily grow, I should make it clear that the whole ecosystem of diverse styles and forms in contemporary aesthetics should not be simply correlated to the shift to information society and the key role played by information management in the social, economic, and political life of contemporary societies. Various other factors are all equally important: these include economic globalization, global aging, the ideas of complexity, emergence, and evolution, the ecological thinking manifested in such paradigms as "cradle-to-cradle" manufacturing, recyclable and sustainable design, new materials and manufacturing processes, new distributed production networks and logistics of their coordination, and even the changing political and social climate of different decades (the post-Cold War euphoria of the 1990s versus the obsession with security after 9/11).

The method that I decided to use in my research is comparative. I look at the culture of information society by comparing it with the culture of industrial society. The period that is particularly relevant here is the beginning of the twentieth century, when modernist artists

formulated new aesthetics, new forms, new representational techniques, and new symbols of industrial society. I believe that by systematically asking what can be their equivalents in information society, we can begin to see more clearly the specificity of our own period.

This method is different from the one used in my book *The Language of New Media*. There my question was "What is new about computational media?" I analyzed new media primarily in relation to post-Renaissance visual culture including Modern art, and so-called old media, that is, the dominant media technologies of nineteenth and twentieth centuries (photography, cinema, video.) My use of history in that book was pragmatic and deliberately varied: since each chapter focused on a particular technique or convention of new media, I constructed the particular historical trajectory that I felt was best to illuminate this technique. In this way, every chapter traced a different path through the modern history of visual culture and media.

In the info-aesthetics projects both my subject matter and my use of history are different. Rather than approaching the question of computational media specificity in relation to the histories of various media, I am looking at the key differences between the cultural logic of our computer-based culture and that of the earlier cultural period: Modernism. I hope that such an approach will help to bring the emerging discipline of media studies closer to other fields in the humanities: art history and criticism, literary studies, cinema studies, as well as architecture and design history. All these fields rely on a concept of Modernism that is by now very familiar and well understood, but they have only begun to seriously deal with contemporary computer-based culture. I hope that by showing how the problems that animated the work of modernist artists can also be seen at work in contemporary information culture a bridge will be built between the people focused on these seemingly unrelated domains of study.

Another standard concept widely used in recent humanities and cultural criticism—the idea of postmodernism—also appears in info-aesthetics, although in ways that may displease many of its users. I suggest that some of the new aesthetics of the 1970s and 1980s, which were at the time described as "postmodern," were in fact only an intermediary stage between the Modern and the informational. In other words, in the cultural sphere, postmodernism represented only the very beginning of the computer and information revolution. It did not constitute a fundamental paradigm as important as that of Modernism.

Info-aesthetics does not require us to use the term "new media." Why is this so? In *The Language of New Media* I was interested in the emerging languages of "new media," which I defined as the cultural forms that required a digital computer both for their production and consumption: computer games, Web sites, CD-ROMS, virtual environments, interactive installations, and so on. In other words, if you want to know if something is "new media" or not, simply ask if you require a computer to experience it. If the answer is yes, you are dealing with "new media." Regardless of your particular experience, what you are really doing is interacting with a software program that is currently running. If the user is navigating an interactive multimedia presentation in a museum, browsing the Web, or playing a computer game, some program or programs make it all possible: a director program generating multimedia screens, a Web browser interacting with the server to pull the data and put it on the screen, a code controlling NPCs (non-player characters) or calculating the physics necessary to represent a realistic collision between two cars in a computer game, and so on.

Since finishing my analysis of software-based media forms I have started to expand my investigation "horizontally" to include as many other areas of culture as I am able. It was clear that the adoption of digital networked computers in almost all cultural areas was to continue, and

therefore in a few years the distinction I was still able to maintain in *The Language of New Media* between "new media" and other cultural practices would become less and less useful. At the same time, as both computer-based design and production techniques were becoming more standard in the fields responsible for our material culture—industrial design, architecture, fashion, experience design, brandscaping—these fields started to attract me more and more. If the "new media" of the 1990s, as all the examples in the preceding paragraph illustrate, was primarily "screen media," from now on computers were likely to have equally significant effects on the aesthetics of our material environment. Add to this the slow but steady rise in importance of the new computing paradigms of ubiquitous computing/ambient intelligence/ smart objects, and it was becoming clear to me that if we are to follow the effects of computers on culture, we need to seriously start looking outside the screen. In the years that followed, I spent endless hours in airports, visited many cities on four continents, attended numerous media festivals, architecture reviews, design exhibitions, and industry events, met so many people that my brain now often refuses to release even the names of my friends, and spent more time on orbitz.com and hotel.com than on any other Web sites. I do not think I could have done my research in any other way, and certainly not by Web surfing alone.

Info-aesthetics, therefore, does not examine "new media" specifically. Rather, it examines the various cultural fields (as many as I can keep track of) where the use of computers for design and production gives rise to new forms. Some of these forms are "screen-based"—for instance, information visualization—but many others are material. In the end, I feel that my own shift of interests parallels the shift to where what was once called "new media'." really happens today. Ten years ago, an interaction designer would produce something that played on a computer screen alone. Today the common understanding of this profession is very different: according to Wikipedia, interaction design "examines the role of embedded behaviors and intelligence in physical and virtual spaces as well as the convergence of physical and digital products. "[4] The cultural sites where the digital and the physical meet is also the key subject of info-aesthetics. But rather than think only in terms of convergence, as a cultural historian of the present I am also thinking about other relationships: those of conflict, contradiction, borrowing, hybridization, remix.

NOTES

The author has been developing these thoughts since 2000 on INFO-AESTHETICS, a "semi-open source book/Web site in progress," at http://www.manovich.net/IA/.

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[1] Takashi Hoshimo reports: "Posters in Japan are being embedded with tag readers that receive signals from the user's "IC tag and send relevant information and free products back" (Hoshimo, "Bloom Time Out East," http://www.mobile.ent.biz, accessed November 20, 2005).

[2] *Apparition*, choreographer Klaus Obermair, production Ars Electronica Future Lab, presented at Ars Electronica festival, 2004. Art+Com assisted in staging Andre Werner's production of Marlowe's *The Jew of Malta* at the Muffathalle, Munich, May 2oo2. For other interactive environments and similar projects see http://www.artcom.de.

[3] Statistics from "How Much Information" report; http://www.sims.berkeley.edu/rese arch/projects/how-much-info-2003 /. Data current at time of publication (October 2005).

[4] Wikipedia (English), "Interaction Design," available online at http://en.wikipedia .org/wiki/Interaction-design (accessed October 16, 2005).