# The Infome - the ontology and expressions of code and protocols. **(Presentation at Crash, London, 2005.)**

**Lisa Jevbratt**

The act of programming or 'coding' is in some sense an act of writing, of typing characters, sometimes in an ordinary text editor, combining characters into "words" and words into "sentences." However, while it is tempting to consider the poetic and literary qualities of coding, due to this similarity with 'writing,' programming is not 'writing.' To write code is to create reality. It could be likened with the production of artificial DNA, of oligonucleotides – a process where life is written. Or it could be seen as a more obviously physical act of generating and moving around material, an act that has dimensionality, that is non-linear. It is an activity that has more in common with sculpting or designing and sewing clothes – to start with a material and feel how it folds and falls, cutting out two dimensional surfaces from it and turning them into three dimensional shapes by sewing them together in specific way – than with writing.

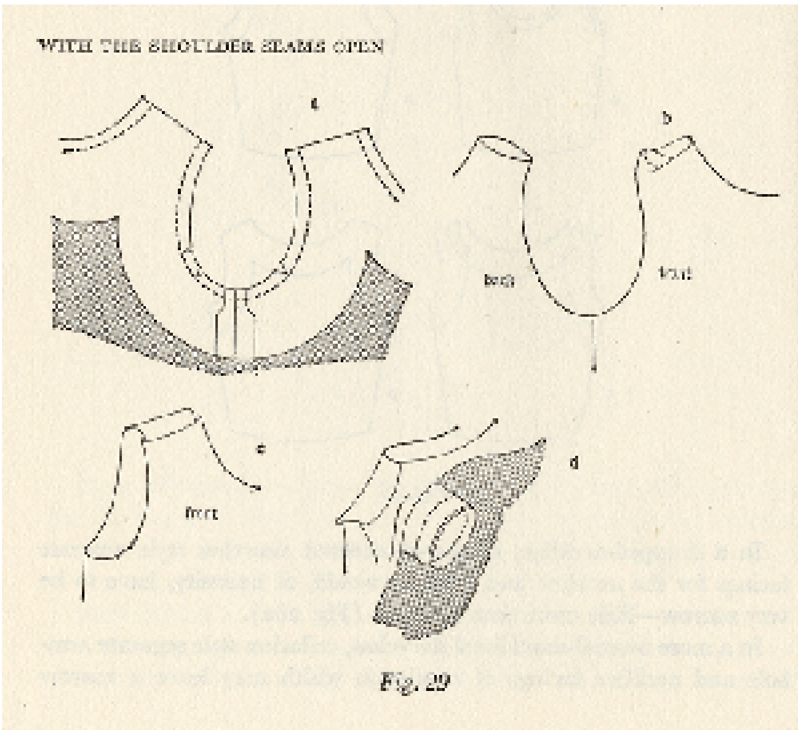


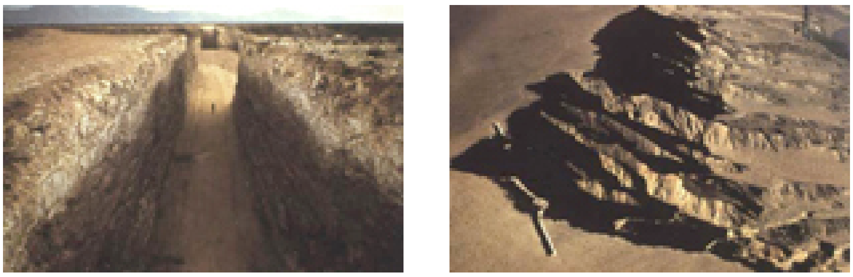

*Fig. 29*

## The Infome

Because of the traditions in which computer languages and code were developed, they are commonly thought of as symbolic abstractions of thoughts and natural languages. Computers are described as the universal machines manipulating these symbols, praised for their ability to simulate any other medium. However, the scene has changed dramatically since the first code breaking machines and other early versions of computers. Every computer now exists in relation to a network, whether it is connected or not. Every software is potentially a networked software, and a building block of the networks we live within and through.

The network of networks, the Internet, is an environment constructed by code – languages and protocols. It is written by us, yet it is 'reality.' 'Code' is the geology, at once a historical trace of our activities, and a determining circumstance, the ground we stand on, dictating the life of the environment. 'Coding' is the act of building the environment, to "move" the environment and a way of moving in the environment. Even if this environment is written by us, the whole (the network), made up of its parts, (the layers of languages and protocols, the packets, viruses, data, etc.) might have reached a level of complexity and richness high enough to make it interesting to consider it as an organism. It now seems fruitful to postulate that computers are no longer interesting because they can simulate reality, but because they transform the written word into reality, a reality whose ontology is to be found in and between 'environment' and 'organism,' and even if the complexity of the network of networks and their data have not yet reached a threshold where the network actually transforms from merely a set of connected nodes to an entity worth describing as a totally new category, form, or dimension, a rich and fascinating set of issues and areas of research open up by claiming so and solidifying it by giving it a name. I propose the term 'Infome' to denote this all-encompassing network environment/organism that consists of all computers and code. The term is derived from the word 'information' and the suffix 'ome,' used in biology and genetics to mean the totality of something as in chromosome and genome.

*Amarillo Ramp*, Robert Smithson, 1973



*Double Negative,* Michael Heizer 1969-1970

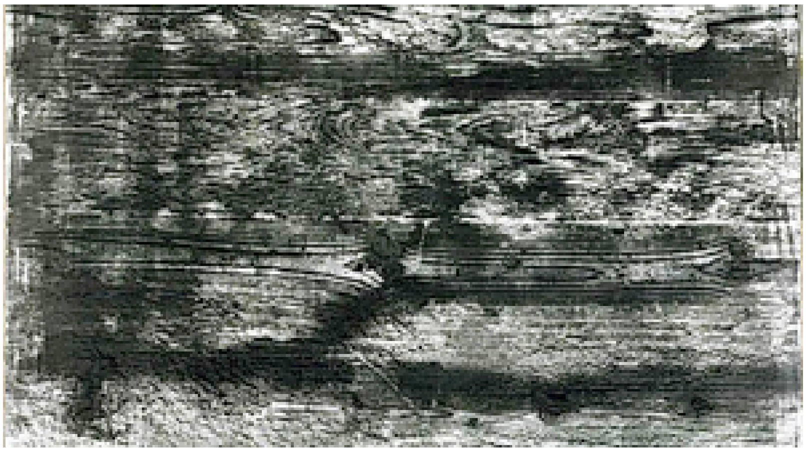
Within the Infome, artist programmers are more land-artists than writers; software are more earthworks than narratives. The "soil" we move, displace, and map is not the soil created by geological processes. It is made up of language, communication protocols, and written agreements. The mapping and displacement of this "soil" has the potential of inheriting, revealing, and questioning the political and economical assumptions that went into its construction. Moreover, this environment/organism is a fundamentally new type of reality where our methods and theories regarding expression, signification, and meaning beg to be redefined. I want to briefly point in some directions of inquiry that are of immediate importance and interest for me as an artist working in and with 'code.'

## Abstract Reality (the semiotics of the Infome)

Within the paradigm that views the computer as a manipulator of arbitrary symbols, the dominating mode of the sign is the *symbol*: a sign in which the signifier arbitrarily relates to the signified, and where culture and convention dictate the meaning of the sign. Within that paradigm, software is seen as non-physical, and it is hard to justify the existence of an indexical sign that connects the signifier and the signified through an actual, causal imprint.

However, since the Infome paradigm views the network environment/organism as 'reality' and 'life,' the symbolic representations – the binary states, the data – are actual entities, not references to entities. They are actually affected by events involving them. Within the Infome paradigm, the dominating mode of the sign is not the symbolic, or the iconographic, but the indexical.

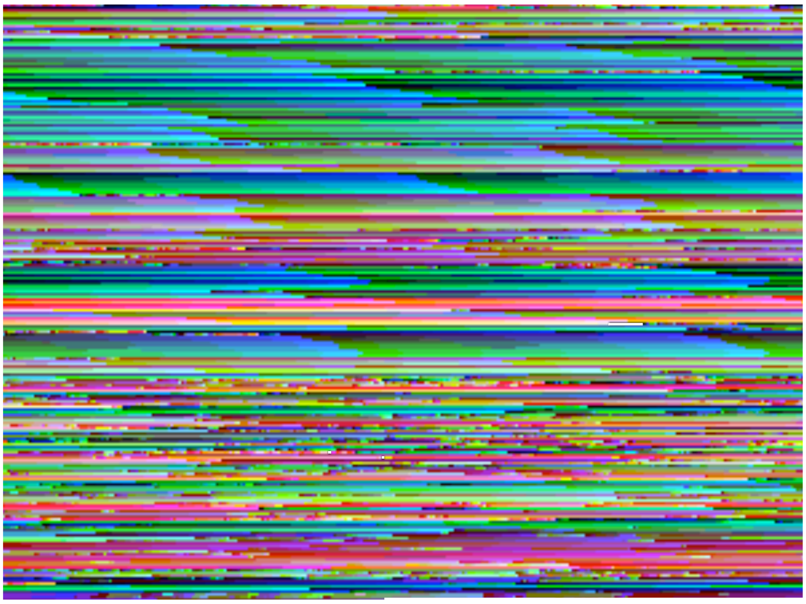
This is a fascinating shift, resulting in new aesthetic expressions and implications. Images can now simultaneously be reality, since they are part of the Infome and an imprint of that reality, as if the image produced by a potato stamp were also a potato. This new emphasis on the indexical opens possibilities within the field of information visualization, which I currently work within. Instead of representing data symbolically by filtering it through known visual forms (such as using it to mimic aspects of physical reality) data can represent itself by being a slice of it or by "smearing off" on something. The visualization is an indexical trace of the reality, an imprint, a 'rubbing,' a manipulation of the reality, and it is reality.



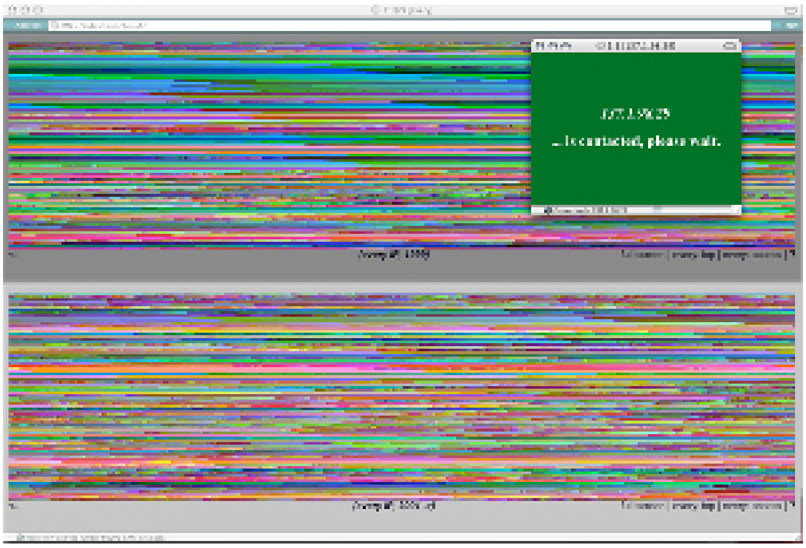
Wood Rubbing

## *1:1*

I first started to explore these ideas with the projects *1:1* and *1:1(2)*[1]. *1:1,* which were originally created in 1999, consisted of a database that would eventually contain the addresses of every Web site in the world and interfaces through which to view and use the database. Crawlers (software robots, which could be thought of as automated Web browsers) were sent out on the Internet to determine whether there was a Web site at a specific IP address (the numerical address all computers connected to the internet use to identify themselves.) If a site existed, whether it was accessible to the public or not, the address was stored in the database. The crawlers didn't start on the first IP address going to the last. They searched instead for selected samples of all the IP numbers, slowly zooming in on the numerical range. Because of the interlaced nature of the search, the database could, in itself and at any given point, be considered a snapshot or portrait of the Web, revealing not a slice but an image of the Web with increasing resolution.

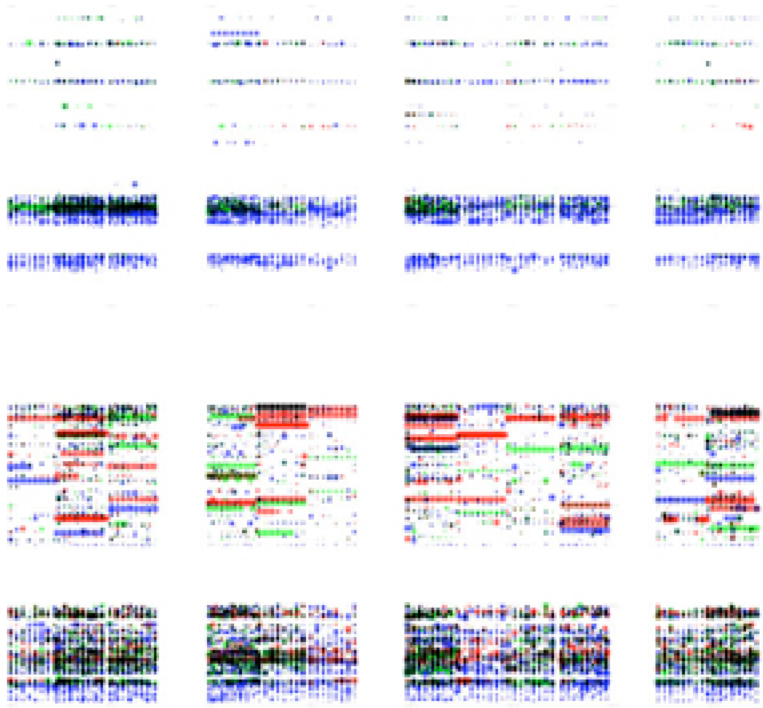


*1:1 Interface: Every(IP).* A visualization of the database also functioning as an interface to the sites it visualizes. The image is composed of pixels each representing one Web site address stored in the IP database. The location of a pixel is determined by the IP address it represents, the lower the number the further up on the picture. The IP address 0.0.0.0 would be represented in the top left corner and the address 255.255.255 in the lower right. The color of a pixel is generated by using the second part of the IP address for its red value, the third for its green, and the fourth for its blue value. The variations in the complexity of the striation patterns are indicative of the numerical distribution of Web sites over the available spectrum. Larger gaps in the numerical space indicate an uneven and varied topography, while smoother color transitions and more consistent layers are indicative of "alluvial," or sedimentary, flatlands in the Web's IP space. (Jevbratt, 1999)

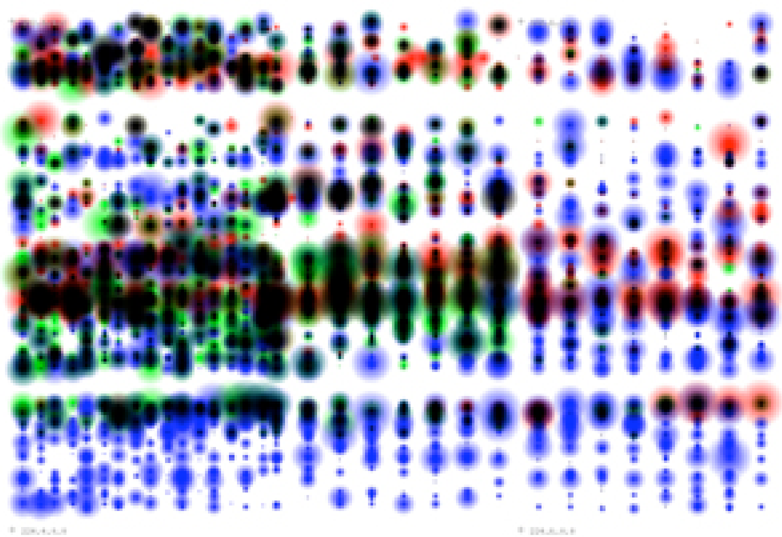


1:1(2) Interface Every, Jevbratt 2001

The initial idea was to continuously search the IP space to eventually have covered the whole range of IP addresses. However, the Web was changing faster than the database was updated, and in 2001 it was clear that the database was outdated. *1:1(2)* was a continuation of the project, including a second database of addresses generated in 2001 and 2002, and interfaces that show and compare the data from both databases. When the project was first created in 1999, the system approximately searched two percent of the total amount of IP addresses, and it found 186,100 sites for inclusion in the database. The second search started in 2001 and was searching the exact same sample of the IP range in order to be able to make comparisons between the Web in 1999 and 2001.



*Migration*. An update of the *1:1(2) Migration* interface made in 2005. Each pixel location on the picture represents 255 IP addresses. The pixel in the top left corner represents the 255 addresses that start on 0.0.0 and the one in the lower right corner the ones that start on 255.255.255. Each blob represents a number of IP addresses that have a Web site. The red blobs represent the Web sites found in 1999 and the green represent the Web sites found in 2001/2002 and the blue blobs the sites found in 2005. The size of a blob is determined by how many sites it represents. Since each pixel/blob location represents 255 addresses, each blob represents between 1 and 255 addresses. The amount of sites is mapped to the blob on a logarithmic scale. The black-brown color is an indication of clusters of sites that existed both in 1999 and in 2001/2002. (Jevbratt, 2005)

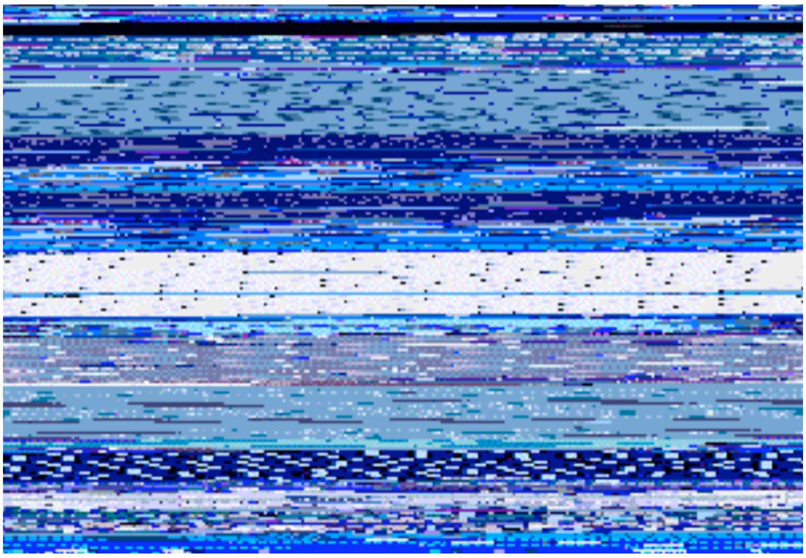


*Migration,* detail, 2005.

## *Mapping the Web Infome*

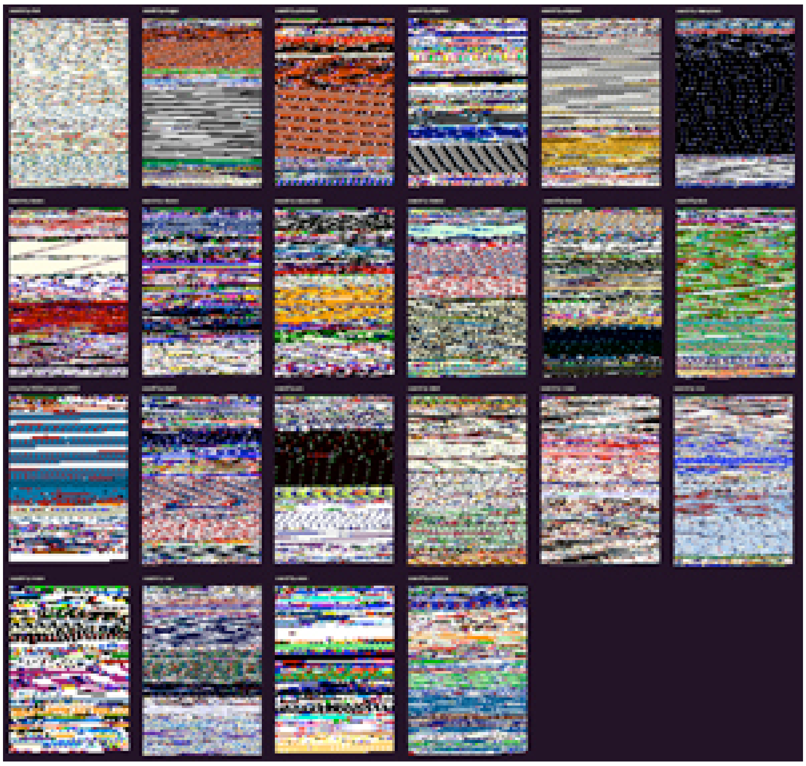
After *1:1* and *1:1(2),* I continued to develop the ideas regarding visualization and the Infome with the exhibition *Mapping the Web Infome*[2]. I invited a group of artists to produce projects with the software *Infome Imager,* which I developed specifically for the show with input from the invited artists. The *Infome Imager* allows the user to create crawlers that gather data from the Web, and it provides methods for presenting and visualizing the collected data. The projects created with the software ranged from textual and systemic investigations to more visual expressions of the Web Infome. Three of the artists, Arijana Kajfes, Jennifer McCoy, and Kevin McCoy, were visualizing the use of color in backgrounds, fonts, and tables from the Web pages their crawlers visited.

The McCoys were starting a crawler by having it search for ‘blue sky.’ The crawler collected only blue, white, and grey colors from the thirty thousand pages it visited.



*Every Blue Sky*. Each pixel is a representation of a color used in a Web page visited by the crawler. The first Web page visited is represented by the pixels in the top left corner and the last by the pixels in the lower right. (McCoys, from *Mapping The Web Infome*, 2001)

In her project *22: search and thou shalt find_,* Kajfes started twenty-two crawlers and made them search for each of the names of the Major Arcana cards in the Tarot deck. Each of the twenty-two crawlers generated an image with the colors collected from the one thousand sites it visited. The images were printed as cards and shown and sold as a Tarot deck in the exhibition.



*22: search and thou shalt find_*. Each pixel is a representation of a color used in a Web page visited by the crawler. The first Web page visited is represented by the pixels in the top left corner of each card and the last by the pixels in the lower right of each card. (Kaijfes, From *Mapping The Web Infome*, 2001)

## Visualization

The *1:1* and the *Infome Imager* visualizations are realistic in that they have a direct correlation to the reality they are mapping. Each visual element has a one-to-one correlation to what it represents. The positioning, color, and shape of the visual elements have one graspable function. Yet the images are not realistic representations; they are real, objects for interpretation, not interpretations. They should be experienced, not viewed as dialogue about experience. This is interesting in several ways. On a more fundamental level, it allows the image to teach us something about the data by letting the complexity and information in the data itself emerge. It allows us to use our vision to think.

Carvings in the Cosquer Cave, France, 27000 years old.

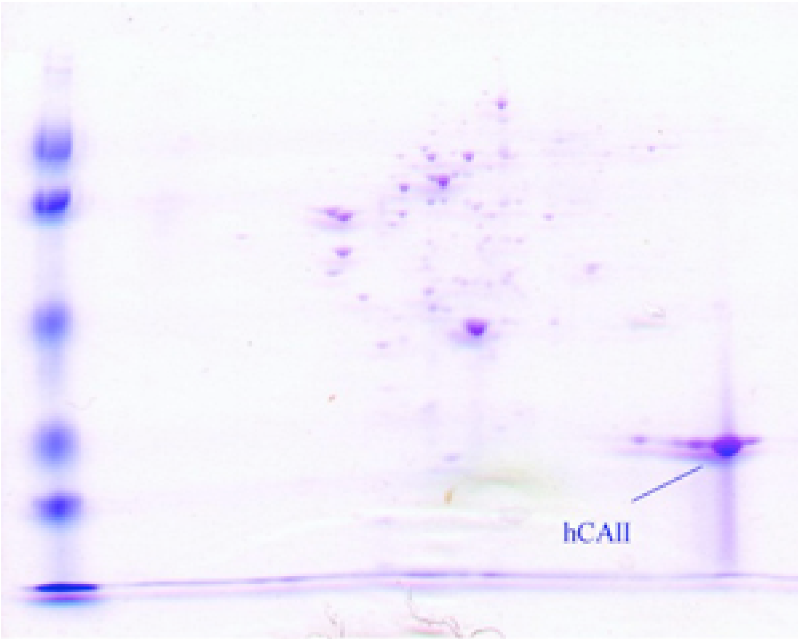
*Number 1, 1950 (Lavender Mist),* Jackson Polllock

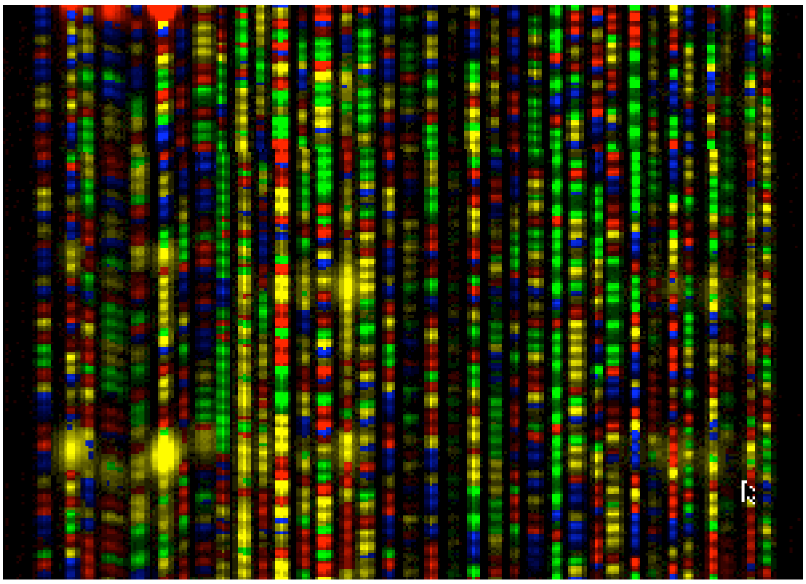
Secondary, it makes the visualizations function as art in more interesting ways, connecting them to artistic traditions from pre-modern art, such as cave paintings, to abstract expressionism, action painting, minimalism, and to post-structuralist deconstructions of power structures embedded in data. The visual "look" that follows from this thinking is very "plain." It is strict and "limited" in order to not impose its structure on its possible interpretations and meanings. The visualizations avoid looking like something we have seen before, or they playfully allude to some recognizable form but yet slip away from it. Viewed from outside the Infome, they are abstract, abstract realism.

The abstract reality in which these images emerge is not a Platonist space of ideal forms, and the images are not the shadows of such forms.

The term 'visualization' is problematic, and would be beneficial to avoid, because it indicates that the data has a pure existence, waiting to be translated into any shape or sound (or whatever medium the latest techniques of experiensalization would produce). The opposite – a view arguing that the data is not there if we don't experience it – could be fruitful as long as it is not seen as a solipsist statement, but rather as a position more affiliated with ideas from quantum mechanics. The Heisenberg uncertainty principle implies that we can only be certain about something's existence if we see it. Everything else is known only with some degree of probability.

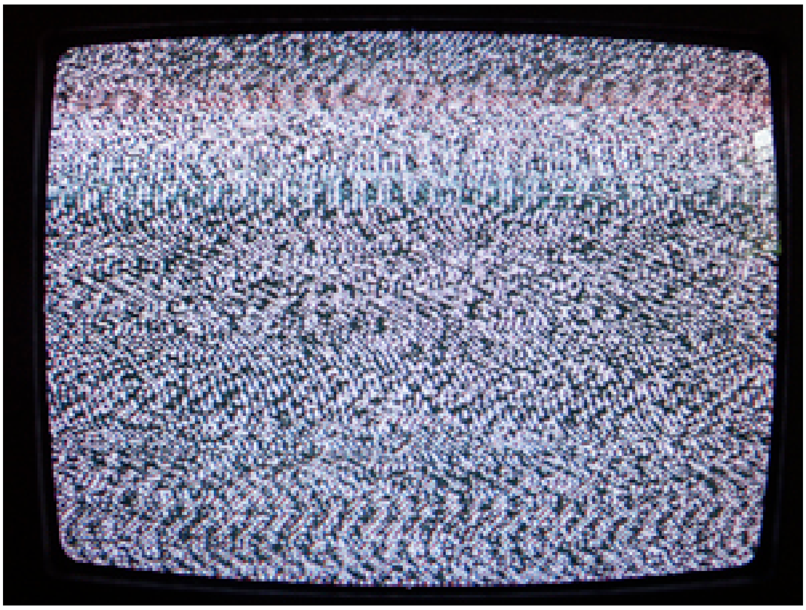
The most interesting examples of visuals displaying data seem to negotiate between these opposite stands. The type of imagery produced in genetics and biochemistry, sometimes called 'peripheral evidences,' are imprints of RNAs and proteins.



"Peripheral evidences." Of DNA and RNA.

They are evidences of something outside themselves, something (truth?) which could produce other evidences, yet, because they are not escaping the methods used to create the imagery, what they say could not be said in any other way.



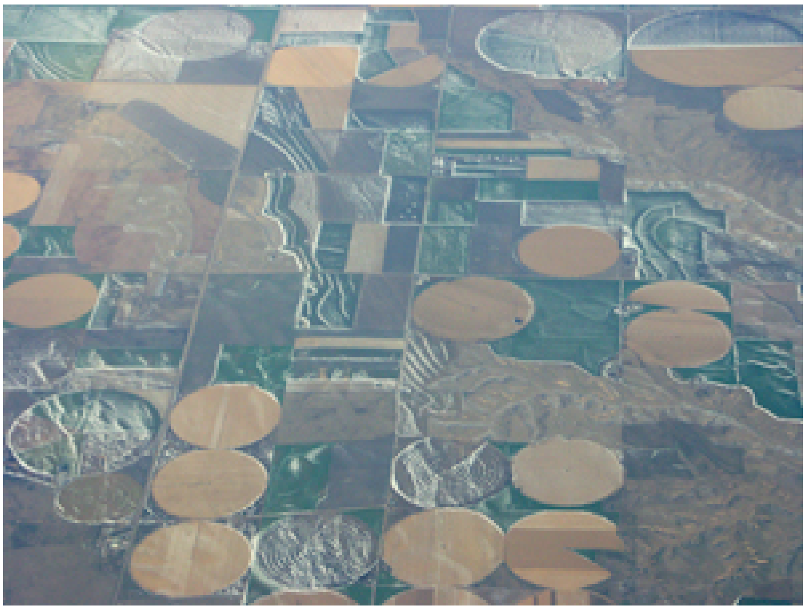
TV static with 1% cosmic background radiation.

Another beautiful example of this simple but complex type of representation is found on TV. The static we see on the TV screen when zapping through non-existing channels allows us to see the Big Bang, the birth of the universe. In the static, one percentage cosmic background radiation is hidden. The visual noise we see is not how we would choose to represent the Big Bang, it is not a visualization of it. It is in fact a direct experience of it.[3]

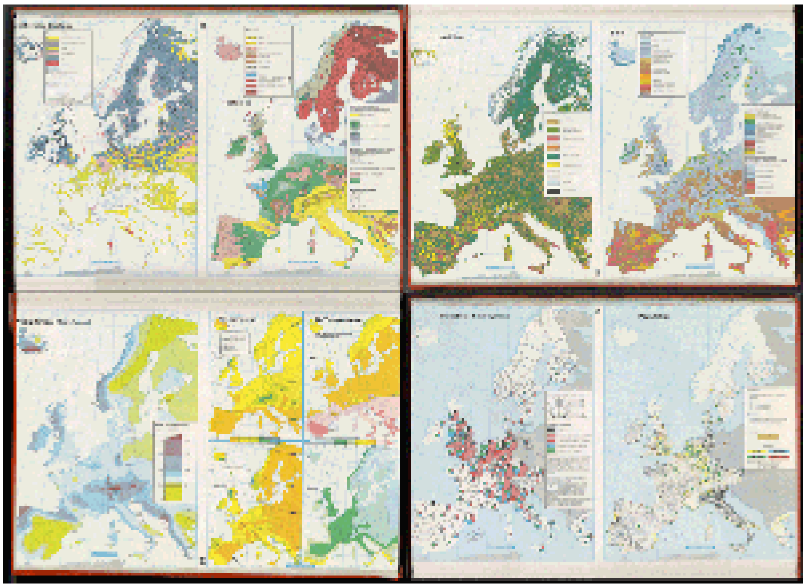
Perhaps the most appropriate term for the TV noise or my “visualizations” would be a ‘net’ or a ‘web’ – an object that traps something. It is an interesting circularity that these terms are now most commonly used to describe modes of connectivity rather than entrapments.

## Protocol Geography

Imagine yourself flying over a landscape, your eyes following the mountain ridges and the crevasses formed by water running down the slopes over millions of years. There are roads crossing the landscape, some of them closely following the creeks and the valleys, some boldly breaking the patterns of the landscape, laid on top of it as if drawn on a map.



There are circular fields, the result of the mechanics of manmade irrigation systems, and oddly shaped fields wedged between lakes and mountain slopes. It is a fascinating display of the interplay between nature and culture, showing off the conditions of human life, our histories, and philosophies of living and relationship to nature. Open any atlas and one will see attempts of mapping this rich connection between geology and anthropology. These images, the view from above and the maps, allows us to "see" layers of our environment, of how we have responded to the geology, the climate we live in, and how we have manipulated nature depending on our beliefs at different moments in time.



A typical display of geographical, political and sociological data in an atlas.

The Infome is made up of layers of protocols and languages, each functioning as the nature, the conditions for the next layer, and all of them together forming the conditions, the nature, which we relate to when "spending time in" (for example by navigating the web) or "using" (by sending an email or transferring a file) the environment. We as people are expressed in this environment as a collective through how we use it, just as flying over a landscape reveals our cultures and their histories through the specific placement of roads, the shape of the fields, and conglomeration of buildings, and, we the humans, are also expressed in its very construction, geology, and climate.

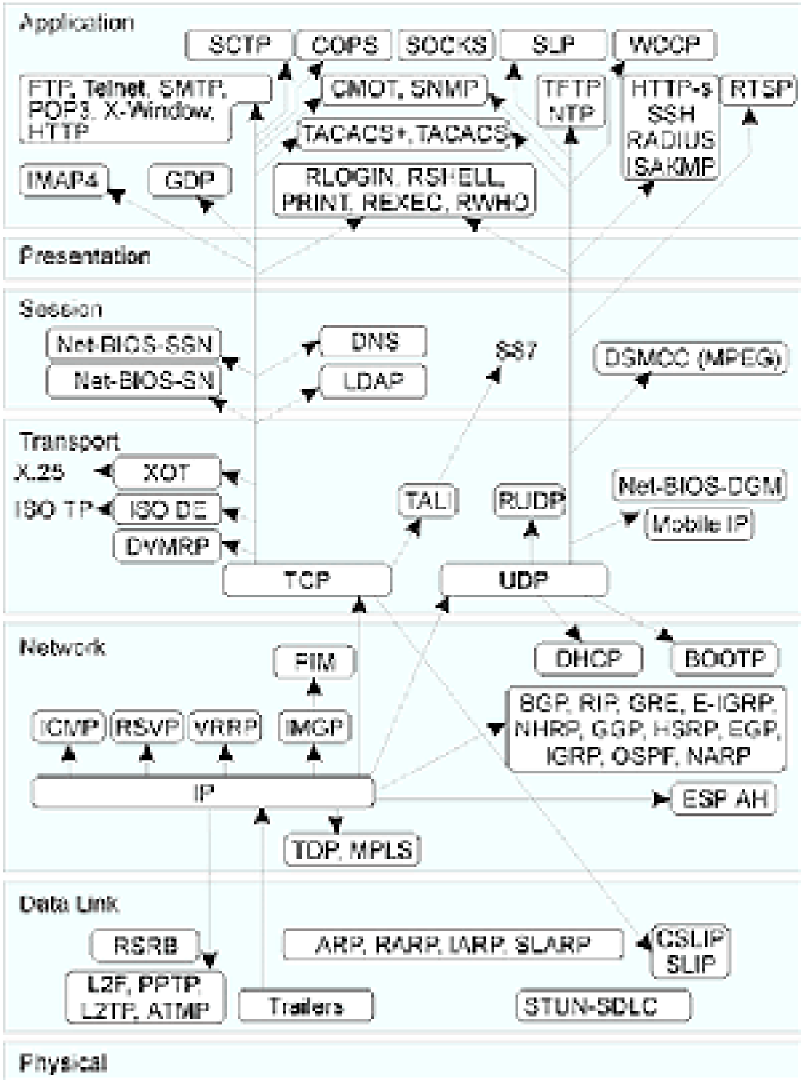



Illustration of the Internet network layers.

## Protocol politics

Different protocols and languages insert themselves in different layers of the Infome. Each layer interfaces to its underlying layer by omitting access to details of the previous layer, simplifying and narrowing the construction of objects and actions in the specific reality layer that the code operates within. A layer can interface with its underlying layer in a more or less acknowledging manner. Some of the commonly used Internet languages/software, such as *Lingo* and *Shockwave*, strongly impose a metaphor from an already known discipline such as film editing, while others such as *Perl* allow the underlying layers to peek through by letting the interfacing filter be of a more abstract nature. *Perl* could be likened to the creek finding its way through the lowest points down a valley, creating a meandering waterway, not always efficient to use, while a Java applet could be seen as a constructed canal that sharply cuts through the landscape, offering a fast and reliable connection between two points but missing out on the cultural and geological history of the landscape it traverses. And perhaps *Flash* could be seen as the colonialist attempt to create borders in a place that is only known from a map, a place that has not been visited by the parties dividing the land, but is very well known by its inhabitants. Think of the straight borders of northern Africa, the result of the continent being divided by nations with political agendas separate from and insensitive to the issues and struggles pertinent to the tribes that were habitating it.

The Internet was created as an open environment, with is protocols and codes readily accessible for anyone interested. The transformation from a mere delivery system to a complex environment/organism that we possibly are seeing the start of is a direct result of that architecture. We have not yet learned how to turn this entity in the making into something profitable, so the obvious reaction from market forces is to counteract the transformation, to pretend that it is a delivery system, and to produce languages and software tools whose main use is the generation of content, containers, and vehicles for the content. They counteract the openness of the network by creating proprietary protocols, languages, and tools that disregard the “geology” of the environment.

## The Unintended

In order to focus on the organic and geological nature of the Infome, my projects disregard the fact that we created it. I choose to examine it from the outside as if I just landed on planet earth trying to figure out whether it is alive, and whether the beings I encounter within it are intelligent or not. I regard the data of the Infome as noise and then head out on a signal hunt. What one finds is how we are expressed as humans in and through the Infome, not what one single human is trying to express.

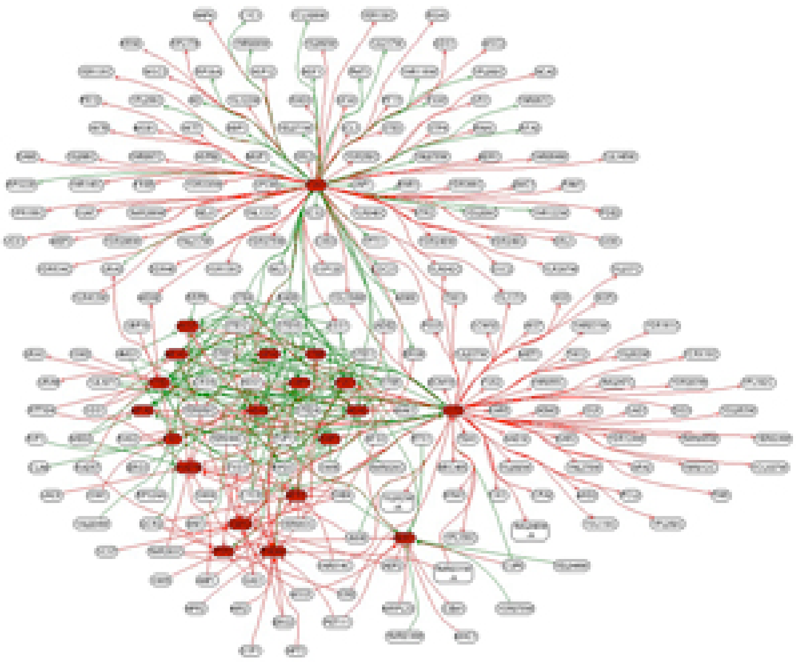
I focus on the unintended or make the assumption that the data is produced without intention, examples from various fields show that this strategy might reveal the identity of any given entity in a more accurate way.

Here I want to mention three interesting examples of how identity can be found in unintentional parts of a system.

Some years ago a student of mine made an interesting discovery in a project he made. It was Web software that returned the result of a search for something on three different search-engines in the reversed order. I.e. the most relevant (however the search-engines define that) was last on the list and the least relevant of the relevant sites was shown first on the list. The result was striking. The least relevant sites, the ones usually so many clicks away we don’t bother to look at them, varied greatly between the different search engines. The most relevant results, the ones usually displayed on top, were all the same.


Ears, Morelli

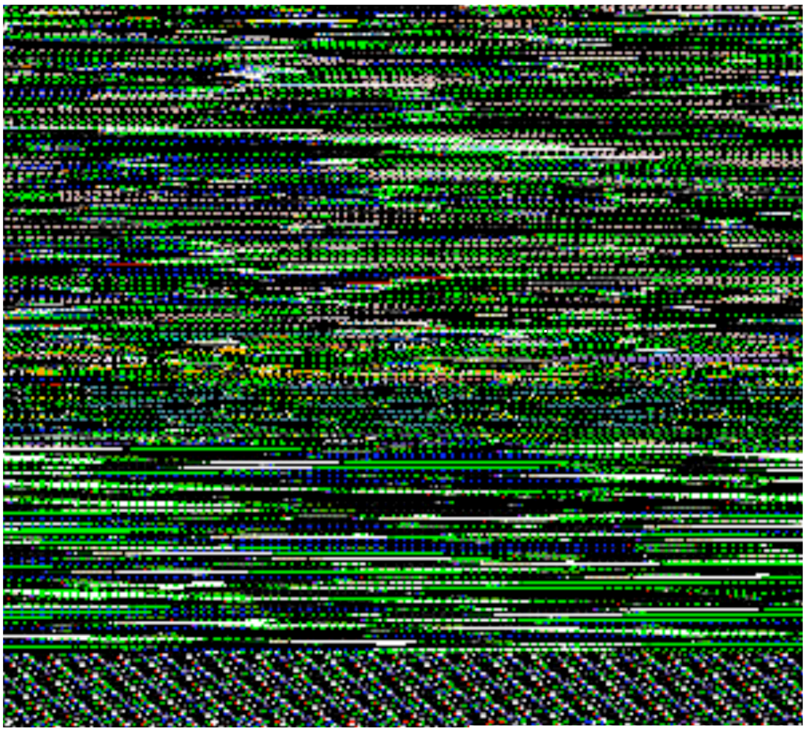
A related finding was made some centuries earlier by Giovanni Morelli (1816-1891). He sought to find a method of determining authorship of paintings and came upon the fact that authorship is more detectable in the parts of a painting done with less intention; the parts which are not significant for the author or the genre in which the painting is made, such as earlobes and fingernails. His method is now called "The Morelli Method". In art historian Edgar Wind's words it is interesting that "Personality is found where personal effort is the weakest".



Another similar finding in biology, was made by Albert-Laszlo Barabasi who in his booked Linked: The New Science of Networks' explains his research on network structures and linkage systems of various fields from computer networks to biology. He finds that “For the vast majority of organisms the ten most-connected molecules are he same.” These highly connected molecules, hubs in Barbasi’s terminology, are equivalent to the most relevant pages in a web search or the traditionally most “important” features in a painting. These are the items, nodes, with the most intent. And just as the least relevant web pages are the most dissimilar, and the least important features such as earlobes say more about the painter, the difference between different organisms and the production of their identity lies in the least connected, least used or significant molecules. He concludes: "[T]hough the hubs are identical, when it comes to the less connected molecules, all organisms have their own distinct varieties."

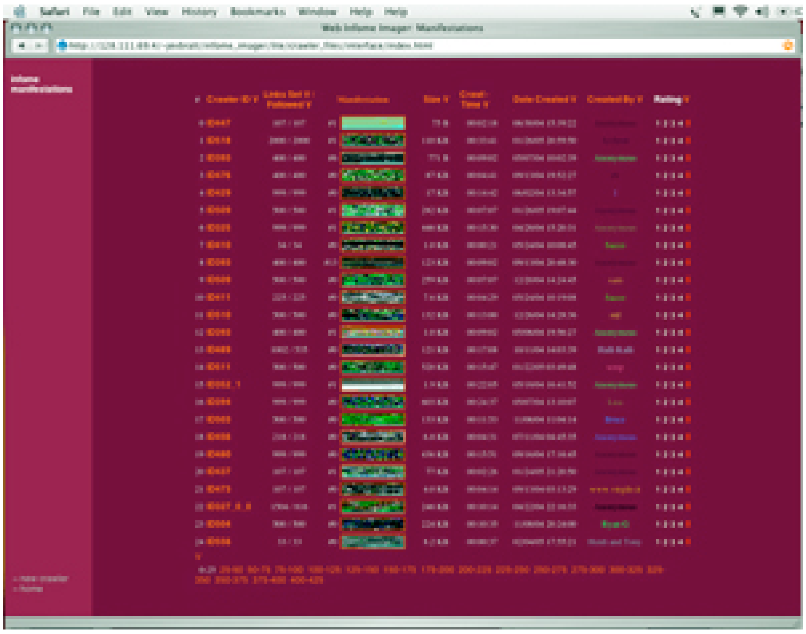
## Infome Imager

When I continued to develop the *Infome Imager* software used in *Mapping the Web Infome*, I focused on its ability to collect “behind the scenes” data – data which is not intended to be read as “content.” In *Infome Imager Lite*[4](2002 – 2005), the user creates crawlers who collect data such as the length of a page, when a page was created, what network the page resides on, the colors used in a page, and other design elements of a page, etc.



Crawler Manifestation, Infome Imager Lite, Jevbratt 2005. The output of the crawler consists of an image (which also can function as an interface to the crawled Web sites) and a legend describing the collected data. Each square represents two types of data collected from/about a Web page the crawler visits. The amount of squares representing one Web page is dependent on the amount of data from/about the page. (Jevbratt, 2004)

The project set up a collaborative environment that glances down into the subconscious of the Web, hoping to reveal its inherent structure and create new understandings of its technical and social functionalities. People can interact with the software on the Web:



The Web Interface Infome Imager Lite, manifestation listing, Jevbratt 2005

And in installations:

The Infome Imager software used in an installation in the Exhibition Techno Sublime at the UC Boulder Art Museum in February/March 2005.

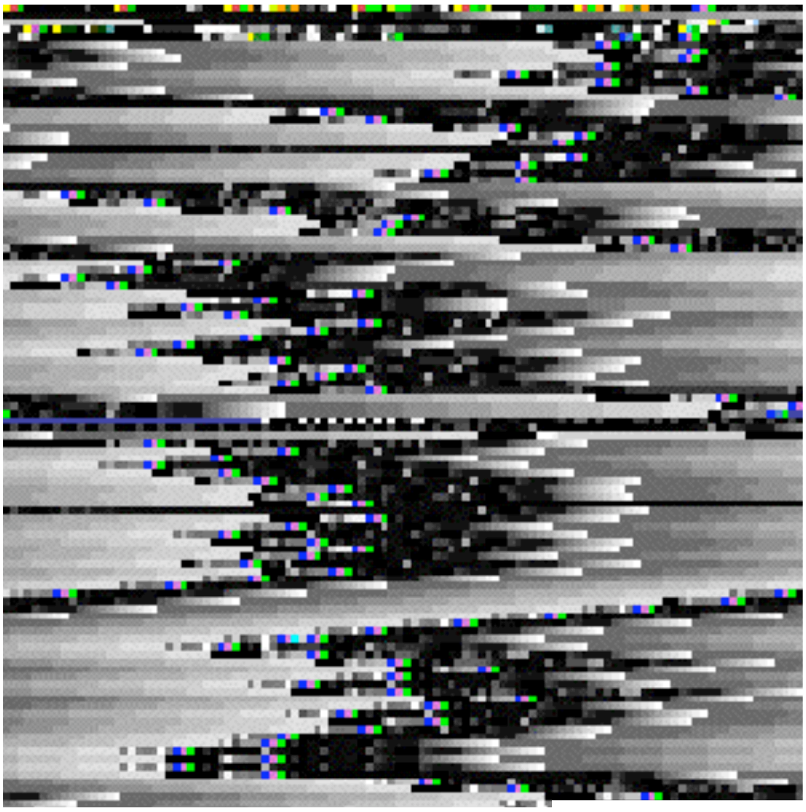
## Openings

The nature of the Infome, its complexity, unpredictability, and beauty, point us in directions that we usually do not consider when engaging with information technologies. It asks us, with a wink, to wonder if something beyond our comprehension is making itself noticed in the appearances of the Infome.

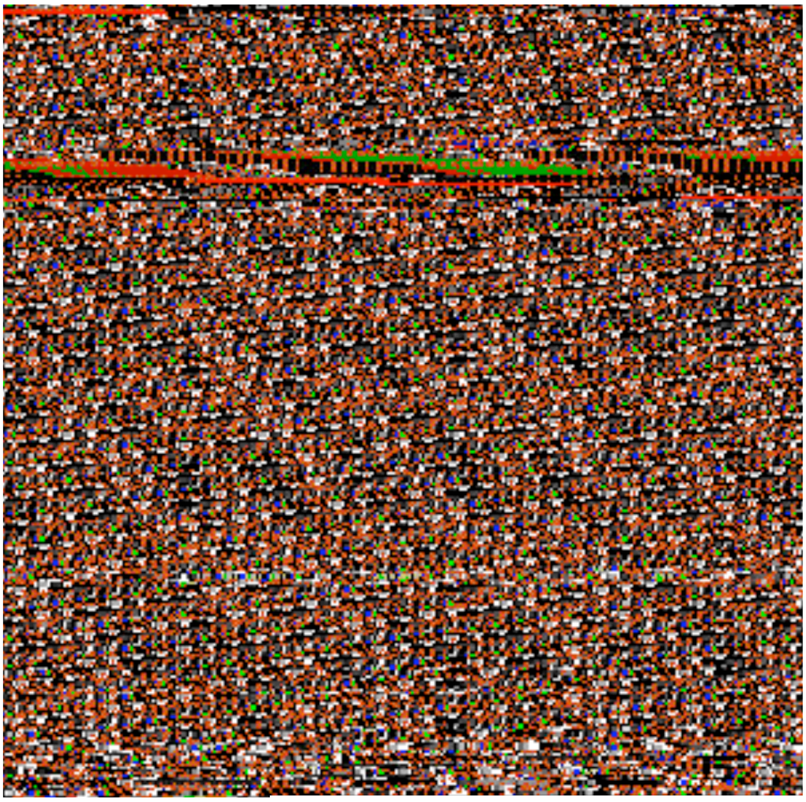
My projects explore the idea of us finding something unexpected, something that shows signs of an awareness hidden within the Infome. It does not look like anything until slowly something emerges that draws attention to itself; something reveals itself, something that lets us know it has meaning.

The trajectory through history to the computer as a symbolic manipulation machine led us through several more or less explicit mystical traditions and practices. It takes us from the Pythagoreans (500 BC) with their number mysticism and Plato (428 – 348 BC) and his ideal forms. It touches the universal art of Raymond Lull (1235 - 1316), a model of understanding that anticipated symbolic logic, and the memory art of Giordano Bruno (1548 - 1600). From there, Gottfried Leibniz (1646 - 1716) got his ideas of a problem solving machine, the calculus, from which Charles Babbage (1791 – 1871) derived ideas leading to his Analytical Engine and George Boole derived (1815 –1864) his theories of binary logic, both cornerstones in the development of modern day computers. The logic conveyed in all these traditions stems from a belief system where there are concepts and thoughts behind physical reality, a system of symbols more real than the reality experience by our senses. This symbolic layer can be manipulated and understood by modifying its symbols. There is a thought entity outside nature, a power that is either in the form of a god, gnosis, a oneness, or in the likeness of a god, as humans.

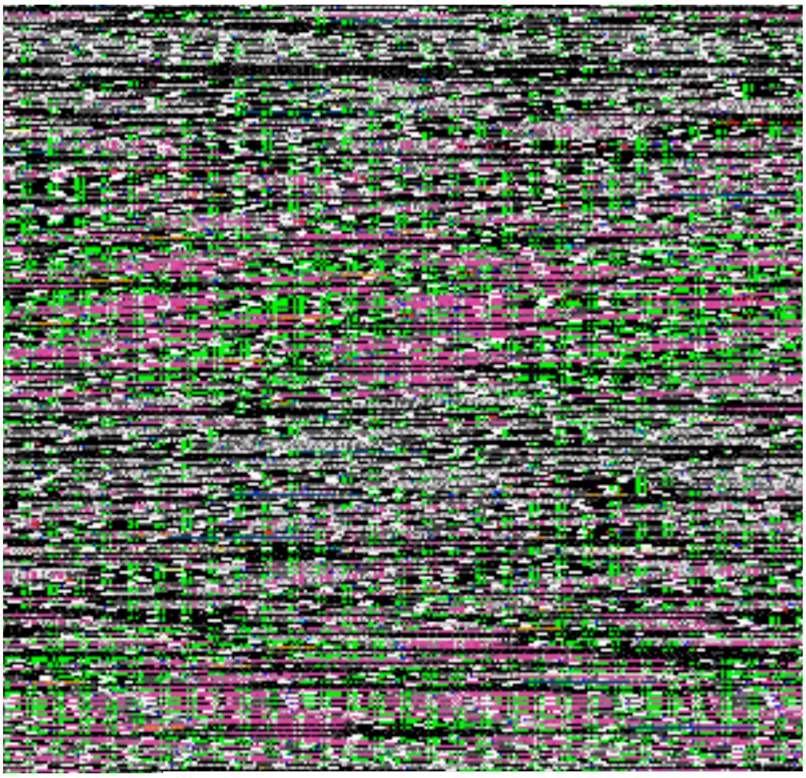
However, if computers now are the access-points to the Infome, and coding and code are processes and entities used to experience and manipulate the reality of a multi-layered environment/organism, then the metaphysical is no longer an all-knowing entity outside, dictating the system, but an emergence, an occurrence within it: a scent, a whisper, a path in-between for a shaman to uncover. And what she, or he, finds is not an absolute but a maybe, made of hints, suggestions, and openings.



Crawler Manifestation, Infome Imager Lite, Jevbratt 2005.



Crawler Manifestation, Infome Imager Lite, Jevbratt 2005.



Crawler Manifestation, Infome Imager Lite, Jevbratt 2005.

[1] *1:1*, *1:1(2)* URL: http://jevbratt.com/1_to_1/
Exhibited at (selected venues): New Langton Arts Bay Area Award Show, San Francisco (1999); Transmediale, Berlin, Germany (2000); Art Entertainment Network, Walker Art Center Minneapolis, (2000); The Altoids Curriosly Strong Collection (2000); The Whitney Biennial 2002, NY, NY

[2] *Mapping the Web Infome* URL: http://jevbratt.com/mapping_the_web_infome/
Exhibited in conjunction with *Lifelike* at New Langton Arts Gallery, San Francisco, 2001. Participating artists: Marc Bohlen, Jan Ekenberg, Ron Goldin, Arijana Kajfes, Lev Manovich, Kevin & Jennifer Mccoy, Giuseppe Prisco, Brett Stalbaum, Kazunori Takahashi and Geri Wittig.

[3] A short History of Nearly Everything, Bill Bryson "Remember that when you think it is nothing on, you could always watch the birth of the universe."

[4] *Infome Imager Lite* URL: http://jevbratt.com/infome_imager/lite/
Exhibited at: *Mapping Transition,* CU Art Galleries, University of Colorado, Boulder (2002), VAERK 04 – *Changing Territories,* Denmark (2004), Video festival Narave/Natures Ljubljana, Slovenia (2004), Ciberart Bilbao, Bilbao, Spain (2004), *Techno Sublime,* CU Art Galleries, University of Colorado, Boulder (2005).