Database Logic(s) and Landscape Art

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Introduction: the logics of database logic

The important question for contemporary information artists working with geographic information systems is, “How do we view the landscape according to database logic?” But before this surprisingly complicated problem can be parsed, there is a semantic issue regarding the meaning of “database logic” that must be clarified before we can embark on our search for an answer. “Database logic” is overloaded. One signature of the aesthetics of database is multi-layered, relating to various data modeling techniques and APIs for accessing and processing data, whereas another signature of “database logic” lies in relation to the visual, audible and interactive presentation of a work: interfacial aesthetics. Thus there are more “database *logics*” than those that are directly manifest in the visual, interactive and user interface related aspects of the information arts. Once past the user interface, analysis is able to expand to the formal organization of data, as well as the computational, semiotic, and cultural behavior that is expressed in the structural coupling of data to the environment in which it functions. The logistics required in dealing with the landscape through database logic necessarily involves the *implementation* of database logic in addition to the *representation* of database logic, and this is a pivotal issue that touches many of the other issues facing artists dealing with landscape as data.

It is in the implementation of relational, object-oriented, object-relational, multidimensional and other database models where explorations of landscape data and its world might be expressed, allowed to self-express, or express in collaboration with human subjects; the user interface is secondary representation to the structure and organization of data. Indeed, it is not even clear that the technical organization of data is necessarily a strong predicate of user interface. This is demonstrated in the cultural realm of human-machinic interaction by the dogged reemergence of the command line interface (mostly thanks to Linux); even as many began to assume that the CLI was dead. Even the computer operating system formerly known best for its GUI Puritanism, the MacOS, is now actually a Unix OS called MacOSX, (it is really BSD [1] under the GUI covers), that for the first time makes a shell interface available

to Mac users. The fact that database is often accessed, designed, and managed using both GUIs and CLIs indicates that the underlying data and various API layers are not necessarily bound to any particular aesthetic experience of database at the interface. [2] This is not to say that there is no coupling between these layers [3], nor is it to say that there is no 'database aesthetic' that is expressed as a visible or interfacial part of our culture. Rather than drive the analysis of database aesthetics away from the interface, the intention is to extend aesthetics down into *at least* the technical implementation of data, allowing the inclusion of data, its organization and possibly *its* inter-textual or extra-textual behaviors regardless of external intentionalities and semantics.

Thus for artists working with landscape data, there are aesthetic correlates to the original question involving the strategic and tactical approaches that are necessary for dealing with the inherent uncertainty of mined/revealed relations amidst (or between) extremely large sets of geo-data organized logically and discretely, particularly in consideration of data with a formal basis in relational or multidimensional algebra. It is not clear that landscape as database art is best expressed through *either* the command line interface or graphical user interface in the first instance, (although I would never deny that it *could* be expressed in such a way). It is possible, and perhaps even likely, that computer artists working with landscape and database might avoid any computer mediated interface to their production altogether. There are other questions which I will treat as well, such as how the nature and conceptions of place are altered by database, and how the nature of being in place (the role of the narrative in place), is similarly altered.

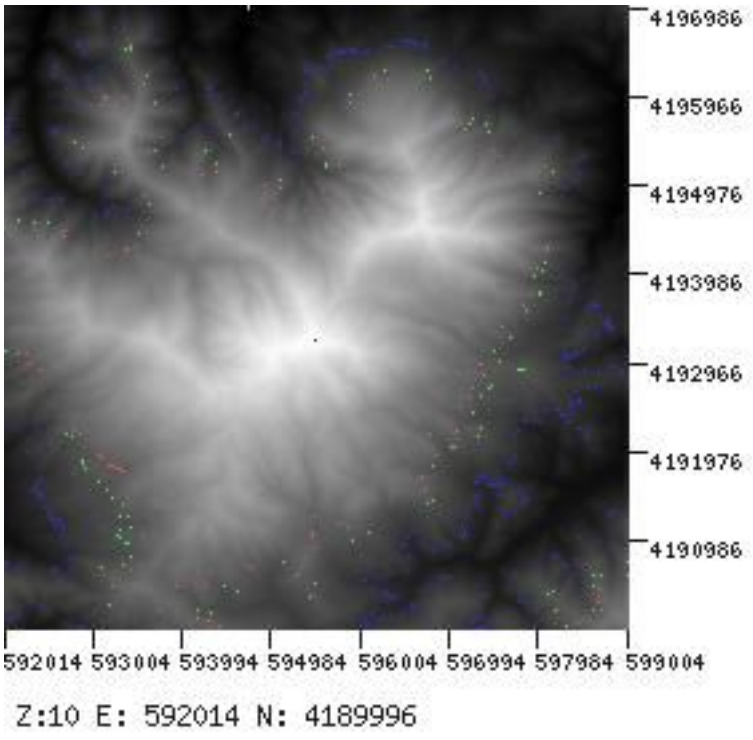
Answering these problems of database and landscape requires a great deal of work, most of which is honestly speculative at this time, and which can not be secured in this essay. But the reason to make art (and to write) is to understand, rather than because one already understands, (exploration not explication), so I ask the reader to pardon the dust as I construct a bridge between the precession of models, the semiotic and cultural context of database, and the formal technical logics of data that impinge upon the practice of database as landscape art. If I mistakenly include the Buenaventura River [4] flowing to the Pacific in my early maps, only at some later time to discover my initial anticipations evaporate in the Humboldt Sink, so be it. The Humboldt Sink may be adequately interesting for reasons other than transport to the Pacific.

It is important to this analysis to reference certain philosophical notions that impinge upon and inform the cultural logic of late 20th and early 21st century art. These will be indexed but not detailed except as necessary to drive this analysis away from certain pitfalls. The first is the tradition of semiology, particularly the theoretical thread that emerged from narrative analysis dealing specifically with the aesthetic consequences of syntagm and paradigm. Another is the precession of simulacra, or matters of models of the real and their impact on, or replacement of, the real. Finally, there is the theory of abstract machines, or immanent models or attractors around which systems spontaneously organize their material manifestation. The first is largely influenced by Roland Barthes, the second derives primarily from Baudrillard, the latter from Deleuze, and his best reader, Manuel DeLanda. The pitfalls that I want to be very careful about are the clichés and metaphors that spin out of the discourse of the postmodern, which have been favored by artists and intellectuals in the 20th century [5], Rather than limit analysis to conceptual models of nomadic ridicule, deconstruction of the text, copy-left cut and paste, or ironic criticism of cultural institutions, I instead seek an analysis that views the precession of models, abstract machines, and the technical logic of

database as aspects of the actual that should be explored by artists [6] in the context of landscape.

Surveyor: Precession of models and landscape

The participation of the landscape in human culture is increasingly understood through Geographic information systems. For example, the emerging discipline of archeological geophysics uses GIS data to explore the influence of geology on human political and economic history. [7] But the operational inversion of this statement is also true: political and economic history inflects (and often inflicts) itself on the landscape. For example geologists and civil engineers enlist geo-data to help physically reorganize the landscape; construction, mining, oil drilling, landfill, agriculture, railroads, urban planning, waterworks, dams and transportation are all endeavors that now prehend the landscape through the use of geo-data. The landscape's own data is a player in the systemization of our decision making. [8] Geographic information systems, including the C5 Landscape Database [9] and related tools, demonstrate precession of the model through processing data via semantically stable data models, over which processing yields information that allows the revelation of knowledge about the landscape which predicts our relation toward it.



Map of Mt. Diablo, California, UTM imager module, C5 Landscape database (2002)

The practical outcomes of this knowledge indicate that the landscape prehends to some degree its own modification by humanity. This concept seems counter-intuitive, but an example makes it straightforward. Dams, for example will be constructed in *topographies and*

geologies that allow them to function as dams. [10] Data models lie in some position between a two way conversation between the cultural and the topographical that lead to actual modifications of the landscape. In autopoietic terms, the exploration of relations between topography and culture through informational interchange is beginning to reveal examples of structural coupling [11] - like behavior between them. To grasp this, it is important to understand that data has simultaneously become a catalyzing factor in the conversation, not merely an analytical tool for exploitation. This feedback loop alters the character of the human relationship to landscape from that of relatively unplanned domination to a somewhat more sensitive symbiosis. [12] Data and control systems provide a channel through which eco-systems are able to express an influence in favor of their own protection [13], In addition, the landscape occasionally demands (or acquiesces to) a new bridge, water diversion, nuclear waste site or freeway interchange. Thus one of the problems that artists (and possibly scientists) working with landscape as data must deal with is the embeddedness of the precession of models in-between the political and the immanence of data as it is processed into information. This political dimension to the inquiry deals with mapping as a cultural production embedded within a set of scientific descriptors which drive our cultural relationship with the land. How can we begin to describe the complexities that emerge from this relationship?

Evidence of the cultural in landscape data, Memphis, TN.

Data, which is non-controversially real in an ontological sense, is now a formative influence on the actualization of the landscape through *virtualization* in information technology systems. The notion of virtual in this description is drawn from Deleuze's schema for describing

multiplicities, as discussed by Delanda. [14] It does not refer to the interfacial notion of 'virtual reality', but rather to the actualization of reality through velocity vector fields (or tendencies to behave) that manifest themselves as actual (measurable) trajectories of physical systems as expressed in relational constraints between its vectors. The trajectories resulting from relative constraints tend to settle into consistent patterns of interaction with one another. Observations of velocity vectors and trajectories in actual systems allow phase portraits describing such systems to be embedded in simulated manifolds consisting of descriptors of the vectors and their trajectories. The phase portrait simply describes the interactions inherent in the actual system. Applied science utilizes this schema to model physical systems; analyzing behavior through repeated observations of actual physical systems, and then using computer models developed through the informatization of such observations into manifolds to animate vector descriptors into phase portraits. Through simulated manipulation of descriptors describing velocity vectors, scientists are able to model natural systems and predict complex behavior. The United States, for example, has ceased to physically test nuclear weapons, because these can be tested *virtually* with super-computer simulations.

For Delanda and before him Deleuze, virtuality is not merely a contemporary artifact of computation, but rather identifies the proximity of concrete attractors, realities which attract the actualization of systems, and which for Delanda replaces essences in philosophy. It is specifically because the virtual is real (or more real than real) that it can be explored computationally, where for example Plato's ideal forms simply can not be computed. In other words, virtuality implies a relationship to the actualization of systems in concrete terms, not transcendental terms. The concreteness of attractors are demonstrated in "various long term tendencies of a system which are recurrent topological features, which means that different sets of equations, representing quite different physical systems, may possess a similar distribution of attractors and hence, similar long-term behavior." [15] In more common Deleuzeian terms, attractors are abstract machines: general abstract processes (such as stratification, meshworks, blind replicators) that play an embedded role in the instantiation of a concrete actual. Simulations *really* help us study actual systems, including geology, watershed, landcover, and topography. Thus the virtual is defined in terms of attractors or actuators of the real, not the imaginary virtual reality worlds that have been the subject of so many art projects.

Data is thus not unreal; it is a virtual reality that participates in instantiation. The mechanisms of data that participate in actualization can be discovered through modes of experimental exploration in virtual space. We might be tempted to infer that it is the information, knowledge, (and related opportunity) that can be mined from modeled data (in relation to the virtual), which play the catalytic role in the generation of the real landscape where humanity is involved, and to a large degree, this has been the case historically. In this view, the techniques of virtual science allow us to search for predictive scientific truths that can be rationally manipulated. But of course, there are perspectives that potentially make this inference problematic. We could, for example, pose a Marxist-semiotic analysis; positing that there exists parasitic cultural assumptions that cleave to (or are expressed in) data models (and thus the data collected), which are otherwise sincerely generated for scientific purposes. In other words, do notions of progress, development, land use, extraction of natural resources and other cultural or economic desires dictate the manifold, perhaps through omission of descriptors, based on the 'purpose' that the data is intentionally collected for? This could

explain the subtle and perhaps even unintentional manipulation of science to either deny or confirm humanity's influence on global warming, to site just one well known example.
Alternatively, data's role in the instantiation of the actual may be a matter of virtual informatic interrelations (or external relations between data sets), forming their own consensual domains [16] that heretofore have not yet been observed as such, but which potentially inflect the operation of actual systems via informational transfer between neighboring systems of interrelations. In other words, data interrelations may themselves be vectors that influence the trajectory of actual systems. This theory depends on the idea that data is not only real, but actual, and capable of actualization. Although it is likely that all of these issues are all interoperable to some degree, Joel Slayton hints at C5's orientation by posing the following: "These are factors of economic and political assessment which infer that database logic necessarily has to surpass intentionalities. Are artists just going to do economic, rainfall and surveillance models, or does the question shift to other subject-less concerns of mere informatic relations? If so, what is the semiotic context?" [17] Subject-less (or non-semantic) informatic relations must express some form of semiotic-like behavior if actual (because actual systems can ultimately be signified, such as imaginary numbers), but would be difficult to penetrate from either the examination of their semiosis, (how do we observe a system when we don't know what questions to ask), and from the perspective of a language to express that which is after all non-semantic. "Clarity endlessly plunges into obscurity" [18] under such analytical circumstances. This is obviously a highly speculative territory, but if tactics to reveal such relations of data can be developed, and if they can be generalized, then we have a new understanding of database [19] that may account for the two way conversation between the cultural and the topographical, (or the genetic, the chemical, the quantum, etc.) C5 enters this terrain in explorative fashion though the semiotic context of our discipline (as artists), with landscape and its data as the object of study.

Mountainous: Semiotics, and the precession of semantic models

To explore the issues of virtuality in a cultural context, I observe first that the semiotic context culturally (for artists, not necessarily for subject-less informatic relations) is one in which the precession of models is related to a supposed semiotic reversal of syntamatic axis and paradigmatic axis within the more general cultural logic of database. Roland Barthes (generation 68) demonstrated that symbol systems are capable of taking on additional layers of meaning as systems of connotation (paradigm) emerge on top of systems of denotation (syntagm). [20] Lev Manovich (generation 89) demonstrates that one of the cultural implications of database is that paradigm (model) becomes increasingly visible in relation to syntagm, speculating its eventual replacement as the explicit axis. [21] The model (name, address, phone, email) moves to the foreground, while the story of the population of the database (first sale, 7 billionth customer served), becomes less visible. I say that this is the "context culturally" because this axis (in various positions) has been apparent as an aesthetic issue since the early 20th century. For example, consider the classic Hollywood style of narrative film editing (tending toward emphasis of the syntagmatic axis) versus the paradigmatic montage techniques of Vertov and Eisenstein in early 20th century cinema. I will raise questions about this bi-axial cultural model soon enough, but for the present time we need it to chase out those questions.

This axial semiotic context and its supposed historical shift toward paradigm are historically simultaneous with the precession of the model through active digital sign systems. [22] The virtual is not a result of computation, but rather the virtual was discovered during a two century period when the resources making computation and model based exploration possible were developed, including many mathematical discoveries. The virtual (call it what you will: attractors, abstract machines) was discovered using these resources, rather than being created by them. It would be extremely difficult to argue against the notion that the late axial shift noted by Manovich (somewhat simultaneously with the postmodern), is not related to computerization and informatics; particularly the emergence of database starting in the 1960's. And Baudrillard, for his part, makes it quite plain that "the real is produced from miniaturized units, from matrices, memory banks and command models" [23] in his discussion of precession. Hence the axial shift observed in semiotics is very likely bound to precession in some way through information systems and the discovery of the virtual. How might we tie these phenomena together?

A preliminary view is that the precession of models is in fact an intermediary between the technical logics of database and its expression culturally. For example, the design of a relational database management system starts with semantic techniques such as entity relationship modeling (ERM) in order to build a bridge between the cultural world of the problem (Customer, Invoice, Order, Part number), and the technical organization and type of data (such as tables in a RDMS). Still, the matter of how precession mediates between the interfacial cultural logic of database and data as technical form is complicated by the embeddedness of precession in a context where it can be manifest, simultaneously, as both a cultural mediator and within the technical logic of database. Thus it seems that in order to escape a bad patch of tautological quicksand, (precession mediates between technical form and database culture because technical form is also precession which mediates database culture), we need to distinguish between the analytic *mechanics* of precession, (where Delanda's reading of Deleuze might be of help to us), and precession as evaluative cultural analysis. To some degree, this describes the split between science and the postmodern, and the analytic tradition and the continental tradition in philosophy.

Artist/programmer Carmin Karasic gives a brilliant example of evaluative cultural analysis when she observes that the long financial recession in the United States in the early 21st century was preceded by a decline in the stock market, rather than the decline in the stock market being preceded by the beginning of a recession. [24] In this, we see a situation where the complex, distributed, abstraction [25] that we refer to as capital markets leads the rest of the economy in the dance; *inflecting* other aspects of economic activity such as labor, production and consumer confidence more so than *reflecting* them. Indeed, a casual look at the general data seems very much to support the thesis. This is the profound influence of the *virtual* (in this case, more in the Baudrillardian sense than the Deleuzian), over the actual (such as jobs.) Many view this type of analysis as representative of the triumph of precession, which as we have seen is bound in some way to the foregrounding of the paradigmatic axis in aesthetics. However, working with this largely metaphorical notion of precession, as is the tradition of Baudrillard, seems inappropriate for the kind of landscape as database practice C5 is interested in specifically because it is largely metaphorical. Thus it is as amicable to irony and other distractions of postmodernity (such as Baudrillard's delightful discussions of Disneyland), as it is to insightful observations such as Karasic's. It is hard to get a hook into the actual mechanics of economic history through such evaluative cultural analysis. Certainly,

the provocation of the example would leave economists of different intellectual persuasions arguing on both sides of the proposition.

The notion of precession for our purposes as database/landscape artists is more usefully defined in a narrow technical manner, if mostly for tactical reasons. Under this view, data and informatics inflect a powerful influence over what happens because technical models *are* precession. Precession is technical form that mediates culture through database because we can relate data to everything actual; and "everything is everything that happens". [26] For better or worse, this suspends the matter of cultural analysis, (and a lot of problems with metaphor), postponing precessive cultural analysis at least until we have a clearer picture of actual dynamics. Another tactical reason to work with technical models is that it is to the degree that any speculated shift toward paradigm is expressed in a *technical basis* of data in database logic that there is some space for computer artists to work as computer artists. The models (manifolds, vector fields and phase portraits) we discuss in the context of these tactics are (at least initially [27]) semantically stable, thus we might name the basis of the cultural shift more specifically: *the precession of semantic models*, which allow for calculable processes of deduction to perform algorithmic prediction based on attractors. We view this as an enhancement to the use of connotative traits such as qualities of character, which were formerly the basis of prediction and decision-making, in both the arts and in the political aspect of the landscape.

In a fine example of the latter, explorer, poet and the 1856 United States presidential candidate John C. Fremont [28] explained, "We encamped on the shore, opposite a very remarkable rock in the lake, which had attracted our attention for many miles... This striking feature suggested a name for the lake, and I called it Pyramid Lake." [29] Today, decisions regarding 'where' are made very differently due to the precessive shift: place is evaluated through technical qualities derived from data, because romantic aesthetic analysis of character (such as "remarkable"), can not answer many of the most important questions we have about the landscape today. [30] Rather, the task for artists today is to explore why examples of the sublime [31] are sublime [32] by modeling them and revealing more of their complexity in relation to other systems. This is in addition to examining the prowess of our human aesthetic sensibilities [33], which is still interesting; there is no good reason to jettison the sublime just because it is romantic. Rather, the goal is to understand the sublime as a likely indicator of (or pointer to) the presence of attractor(s) which can ultimately be modeled. Humans are significantly superior to computers in regards to inferencing; possessing profound abilities of induction as compared to the computer's profound ability of deduction. Our tact involves utilizing the participation of people and extremely large sets of data to enhance and even replace what was once the seemingly boundless landscape of the 19th century, a landscape which has become suddenly smaller in the 21st century [34], with a boundlessness of data relations to explore.

The precession of semantic models extends even to naming of place, for example, the UTM [35] system allows the naming of every square meter on the surface of the Earth in terms that emphasize not characterization but calculability. Thus we might infer once again that it is the calculable, mineable, predictable relations of data that function as the primary aspects of data that drive the real. Data and their semantics tend to guide the way they are used, almost as cultural reflex. Are artists bound to work through semantic models in a way dictated by the purposes for which data is collected, such as "economic, rainfall and surveillance?" Are the strategies of contemporary data processing (data processed into information begets knowledge) the artistic Zeitgeist of our time, in much the same manner that the writings of

Edmund Burke [36] influenced the 19th century romantic style in the landscape arts during that previous era?

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The seeming victory of precession and the axial shift toward the paradigmatic in the regime of active cultural processes may not be as complete as the tradition of postmodern aesthetics leads one to believe, because postmodernist thought may in fact be guilty of excessive focus on emerging cultural conditions as these make the sometimes slow transition between novelty and ubiquity. Blinded by novelty in a few dimensions, our observations of the manifold constituting our contemporary semiotic network culture may be lacking important vectors. The semiotic axis may be but two dynamic dimensions/descriptors of a larger semiotic multiplicity. A manifold of undiscovered vectors needing semantic description in order to approach a complete semiotic model may be required to explain our cultural conditions. Such inquiry might explain how dominantly syntagmatic systems co-exist and interact beside dominantly paradigmatic systems. Through this, it might be possible to explain or predict the instability of the polar axis.

These propositions can not quite be demonstrated yet, but there are certainly ample indications hinting that contemporary cultural conditions do not exactly snap to the axial grid. For example, technologically progressive cultural assumptions embedded as secondary meanings on top of primary denotative scientific data can be viewed under the former semiotic regime of the syntagm, while the use of a database and data mining to unearth relations amidst large datasets can be viewed under that of a paradigmatic order through model based processing. Thus there is at least the appearance of quite possibly interoperable systems actively functioning in the midst of different semiotic regimes. An even bigger question mark can be planted in the Earth regarding subject-less informatic relations. Such relations, if they exist, of course remain completely uncertain relative to any axial analysis, because this

semiotic context is after all subject-oriented to begin with. We can assume, and probably must assume, that precession plays a role here, but again, uncertainty abounds.
These are unresolved questions best addressed in practice. This preliminary survey of the issues is the only map we have right now. Even though the shape of the coastline may be a little warped, and even though we know only a little about the terrain to be discovered inland, we can say that we are confident about the general shape of the problems that face artists working with database and landscape. It is time to let the unexpected modify, fill in, even transform that understanding in practice. It is a common safety practice to leave a note, or let some friends know, where you are going (in case you do not come back). The rest of this essay discusses where we are planning to venture.

Multiplicity of the local: Applications of database logic in the landscape

Though only a starting point (again, the situation aesthetically regarding the axial nature of our semiotic context is not so clear), we can nevertheless posit that the nature of place undergoes a motor transformation (because calculable by machines) as the precession of semantic models allows the topographical, geological, statistical, geophysical-archeological, and historical relations between different places to be navigated paradigmatically (the model) instead of syntagmatically (the narrative). In addition to enhancing scientific endeavor, it also opens spaces for aesthetic exploration via algorithmic techniques that are impossible if one is dedicated to romantic or modernist journeys of exploration of the type that reached their zenith in Lewis/Clark (or Albert Bierstadt), and Hillary/Norgay (or Richard Diebenkorn) respectively. An alternative area of artistic inquiry into place becomes its relation to other place, even if not through any obvious geographical relationship. It is even possible that relations discovered may not even be practical in an exploitative sense, but they would be no less actual relations simply because they did not yield a new pocket of crude oil or some such. As a result, aesthetic value changes from that of the landscape's own value as individual space (either beauty, desolation, the sublime), and moves toward a relationship with multiple others. Culture swerves from Nietzsche's Genealogy of Morals toward Deleuze and Guattari's Geology of Morals.
For example, geologists use geomorphic similarity to classify the origin and history of similar rocks from different geographic locations. Such morphological relations emerge through similar general processes of formation; attractors or abstract machines. [37] In the landscape, topologies are also expressed through influences of their emergence through various general processes, (such as stratification, meshworks, replication, and perhaps autopoiesis given what we suspect about the role of data in the landscape), all of which can be modeled and searched. This makes possible the search for an almost limitless variety of 'other' relations, other shores, other paths, other mountains, and other topographical others that are manifest because their formation was organized around similar topographic and geologic attractors. Database becomes a both a context and a tool for exploring the relations between landscapes from arbitrary locals. This alone is adequate grounds for exploration and activity. C5 is interested in more speculative territories as well, such as the issue of how database might serve as a context for exposing unobserved attractors and behaviors; no less than the subject-less informatic relations that may suffice as solutions to questions we have not yet formed.

Perhaps the clearest early example of a paradigmatic influence related to GIS can be found in the Degree Confluence Project [38], which is perhaps surprisingly not an artist driven project, though it is more like an artwork than many artist driven projects. [39] By identifying points (the confluences of integral latitudes and longitudes), and encouraging people to use GPS devices to find these points on the earth, narrative (the story of getting there) emerges as secondary to the model (the arbitrary choice of Latitude/Longitude over the Universal Transverse Mercator system for mapping locations on the Earth). The mapping model, even if in a trivial manner, becomes the primary and very compelling [40] agent of the performance. The narratives come after the (re)discovery of place through the abstraction of the map, rather than the exploration of place in order to create the map itself.
The narratives produced by the Degree Confluence are database alternatives to romantic and modernist narrative, instantiated as they are by actual database logic. The confluences in this case are even rounded to an integer value, which may only be a matter of conceptual convenience, and of course the convenience of those reading the intersections of lines on their maps. But it is tempting also to think of it as a specific issue of model and database culture: the corresponding field in the table can be specified as the type SMALLINT to save disk space. (No floating point to store.) The choices made in the reordering of narrative are no longer at issue for the participants, or for the creators of the work. The map is in command here. The only choices in evidence are tactical ones: it is all about getting yourself to a point that was chosen for you by the model. This would not be conceivable without some instability in the semiotic axis, or precession of semantic models. Failure to explore such possibilities on the part of contemporary artists working with landscape would amount to artistic malpractice. To ignore the contemporary database logics and their impact on aesthetic developments in culture at large is akin to riding a horse to work. In spite of the notion that the model supercedes the landscape itself through precession (Baudrillard's more extreme cultural evaluation of precession), it turns out that we face not the landscape's disappearance before its model, as much as its conceptual reorganization philosophically under concepts inherent to technological societies of the 21st century, where it becomes obvious that data is an actuator of the landscape. Artists should be among the first to recognize this and work with this shift.

Fordable: The body and place in GIS practice

The confluence of the body with place, (and their data), is the final aspect of C5's research into landscape. Treating the body and its position relative to a paradigmatic definition of place and its meaning provides a much needed alternative practice, especially as Generation Flash [41] marvelously rediscovers the brisling downtown area of the hypertextual arts. Just as informatics change the nature of place, it changes the nature of being in place, of moving through place, and of collaboration in place. [42] These in turn inform the moribund theoretical associations of 'network' as physical communications infrastructures, tangles of packets moving over them, communications/collaboration/commerce, animation/browser/server. It instead provides a context (though GIS is only one of many possible antidotes), to reveal abstract machineries to be explored via a network theory in an expanded field, using the contemporary tools of computation and network, but without being blockaded by an analysis of the technical foundations and social manifestations of merely one kind of network: the internet. The schema for exploring these issues is, for C5, the

implementation of relational systems in which the landscape is allowed to have its say in any imaging (including nature photography, drawing, painting), performance art (the body and the landscape), land art (the modification of the landscape), and database art (the management of geo data and processing), that emerge in collaboration with all involved agents: artists/audience/parasite, as well as the land itself. Who knows, maybe even some traditional net.art will emerge from this activity.

There are unexplored spaces on the surface of the earth in the sense that there are unexplored relations of landscape that can be revealed through its data. Technical barriers, such as the politics of data collection and acquisition, numerous, inscrutable [43] and/or inconsistent data formats, and a lack of available software for processing the landscape outside of a frame of assumptions [44] placed on GIS software by cartographers, geologists, hydrologists, planners and oil companies, must be overcome for artists to work with geo data in any other manner than as data visualization, or ironically conceptual in the postmodern sense. New terminologies for landscape (aesthetic and technical) are required to expose the spaces between spaces that that may be occupied. C5 is not the first art endeavor to build its own GIS codebases, and this is not at all unrelated to the fact that the work that impresses us most with its conceptual richness is that by artists who create much of their own software [45], rather than to make use of packaged GIS solutions. We need our own tools, designed with the endeavor of mining conceptual richness from the materials of the Earth as the primary specification, not the extraction of natural resources. To do so, we must select the manifolds for our experiments from our observation of the landscape as artists, in addition to the obvious: integrating the observations of science in art works. Rather than place ourselves into the landscape by imposing on it, we seek collaborative interactions with it in a manner mediated by its data and its ontology.

Another technical issue is how to populate the manifold with appropriate velocity vectors in order to create a portrait of the phase space that may identify regions of attraction. To put it bluntly, we can't wait for mountains to erode or explode so we can model relations in a dynamic landscape. In order to twiddle the degrees of freedom in a modeled system in order to predict, we have to have good initial observations of the system in motion. But it is difficult to get dynamic models of the landscape given geological time scales. (This is why earthquakes are hard to predict, there is just not enough historical data to get the best predictive model.) Most of the available data about the landscape is a static temporal snapshot of the landscape. One common technique for exploring such static data is to add arbitrary vectors to the manifold, and then animate them under the constraints provided to them by the initial data set, allowing analysis of inter-relations, and interpolation of aspects of the system's phase portrait to be revealed through interaction with related, or even speculative, vectors. (For example, you can reveal past topographies in order to speculate about the differing climatic dynamics of past landscapes through adding erosion models and predictions about plate tectonics to the analysis.) For C5, the behavior of the body in the landscape is an obvious vector for exploration in this regard, both for reasons of art history, and because our collaborative process as artists already involves meeting, training and performing experiments in the outdoors.

This is the nature of informated eco-data-art that we have laid out for ourselves. We suspect that along the way there will emerge aesthetic, conceptual, algorithmic, and physical embodiments that will demonstrate an alternative aesthetic practice for data Marco Polos, data Lewis and Clarks, and data Micheal Heizers. Without doubt, there will also be data George Mallorys, data Donner parties, and data Robert Smithsons. Both glory and tragedy (often in

simultaneity) are inherent aspects of exploration. These are to be expected in a data frontier so vast and relatively unexplored.

Endnote:

This essay was not written, but rewritten many times. Valuable editorial work was contributed by Geri Wittig, without whom I do not believe I could call any of my texts writing. Also, commentary on various drafts from Anne-Marie Schleiner and Joel Slayton were immensely helpful, as well discussion with Lisa Jevbratt, Jack Toolin, and Carmin Karasic, on various aspects of the sublime and precession. Thank you to Steve Durie for the Memphis image, to Bruce Gardner for GPS tutorials and training, and Matt Mays for forwarding many related URLs, all of which helped me get these ideas into place.

Footnotes

[1] Berkeley System Distribution, a Unix OS developed in the 1970's by Bill Joy and others. http://www.freebsd.org/

[2] The historical influence of the hierarchical database as file system is noted, but the matter is of how it is visualized and implemented as an interactive system. For example GUI's vs Unix CLI commands such as ls, cd, and pwd, are very different aesthetically, even if both depend upon single-parent nodes for containment.

[3] Refer to 2.

[4] Fremont, John C., "1845, Report Of The Exploring Expedition To The Rocky Mountains In The Year 1842, And To Oregon And North California In The Years 1843-44". By Brevet Captain J.C. Fremont, Of The Topographical Engineers, Under The Orders Of Col. J.J. Abert, Chief Of The Topographical Bureau. Printed By Order Of The Senate Of The United States. page 196.

[5] This is itself a nested cliché.

[6] For a related thesis, see Foster, Hal, *The Return of the Real*, The MIT Press, Cambridge, Massachusetts, 1996.

[7] For a good example, see http://fisher.lib.virginia.edu/projects/salem/ The GIS of "Salem Village in 1692" is part of an electronic Research Archive of primary source materials related to the Salem witch trials of 1692.

[8] This is one aspect of C5's research into geo-data and technology in the landscape: allowing or encouraging alternative examples of potentially healthy and interesting 'revelation' on the part of the landscape to be fulfilled.

[9] http://spike.sjsu.edu/~gis

[10] This is even known to happen "naturally": http://perso.wanadoo.fr/nyos/dam/hazard.htm

[11] Maturana, Humberto R., and Varela, Francisco J., *The Tree of Knowledge - The Biological Roots of Human Understanding*, 1987 Shambhala Publications, Boston Massachusetts. Pg 75. "[A] history of recurrent interactions leading to the structural congruence between two (or more) systems."

[12] For example, data plays a significant role in decision making in the nascent movement to remove unneeded dams in the United States. http://www.sacbee.com/content/news/story/5258320p-6264654c.html

[13] A good example can be found in accomplishments of the Mono Lake Committee founded by scientist David Gains in 1978, who used scientific data as the basis of the Committee's work to save the lake. It was the data that convinced the justice system that the lake needed to be better managed.
[14] Delanda, Manuel, *Intensive Science & Virtual Philosophy*, Continuum, 370 Lexington Ave, NY NY 2002, pg 36.
[15] *ibid.* 15.
[16] Wittig, Geri, "Expansive Order: Situated and Distributed Knowledge Production in Network Space", http://www.c5corp.com/research/situated_distributed.shtml
[17] Quoted from a personal conversation, with permission.
[18] Slayton, Joel and Wittig, Geri, "Ontology of Organization as System", *Switch - the new media journal of the CADRE digital media laboratory*, Fall 1999, Vol. 5, Num. 3, http://switch.sjsu.edu/web/v5n3/F-1.html
[19] Stalbaum, Brett, "Toward Autopoietic Database", a research paper for C5. (2001) http://www.c5corp.com/research/autopoieticdatabase.shtml
[20] Barthes, Roland, *The Rhetoric of the Image, Image/Music/Text*, translated by Steven Heath, The Nooday Press, 1977.
[21] Manovich, Lev, "Database as Symbolic Form", 1998,
http://www-apparitions.ucsd.edu/~manovich/docs/database.rtf,
http://www.manovich.net/docs/database.rtf
[22] This is especially digestible if we recognize that Georges Boole, Charles Babbage and Lady Ada Augusta Lovelace were all 19th century figures; that Alan Turing, Grace Hopper, and Vannevar Bush are contemporaries of the early and middle 20th; and E.F. Codd a figure of the late 20th century and early 21st century. The simultaneity of romanticism, modernism and the beginnings of postmodernism is noted.
[23] Baudrillard, Jean, *Simulacra and Simulations*, Stanford University Press, Ed Mark Poster, 1988, page 167.
[24] Paraphrased from a personal conversation, with permission.
[25] Abstract by definition, given that money is an abstraction of market value.
[26] *Ibid.* Slayton and Wittig
[27] Such models are often utilized to demonstrate or predict bifurcations of the system, or critical singularities under which the systems behavior takes on new forms, including new vectors requiring observation and new semantics.
[28] http://memory.loc.gov/ammem/today/jan31.html
[29] *Ibid.*
[30] For example, the insurance industry would never allow a housing development to be built on an intermittent flood plane, which would be predicted of course by computer models in a GIS system. That is, unless a short, inexpensive dyke is easy to build and does not impinge on water flow into other areas. In other words, topological and geological data again make the decision, even if the homes to be built there would be aesthetically pleasing, or "remarkable".
[31] I am aware that Kant's notion of the sublime involves the idea that the amount of information available to the senses can not be processed, and that the human ability to inference intuitively under these circumstances (and the related feeling), define sublimity. But there is no reason not to suspect that virtuality will not progressively impinge on sublime, specifically because the virtual has enhanced our ability (cybernetically) to model and posses cognitively insights into complex systems. It is likely that the sublime will be constantly

forced to retreat into beauty, but new sublimity revealed, as we ascend a thousand plateaus, so to speak.

[32] This is the specific area of inquiry for C5's "The Perfect View" project. http://www.c5corp.com/projects/perfectview/index.shtml

[33] The notion that the ability to use human aesthetic reasoning to problem solve under circumstances of sublimity is in no way defunct.

[34] For example, it has often been said in the post 9/11/2K1 period that the oceans no longer protect the United States. We could also refer to the ongoing cultural debate over Globalism.

[35] USGS, The Universal Transverse Mercator (UTM) Grid Fact Sheet 077-01 (August 2001) http://mac.usgs.gov/mac/isb/pubs/factsheets/fs07701.html

[36] http://www.library.yale.edu/beinecke/sublime1.htm

[37] See Delanda, Manuel, *One Thousand Years of Non-Linear History*, Zone Books, 611 Broadway Suite 608, NY NY, 1997, Sandstone and Granite, pg 57.

[38] http://www.confluence.org. "The goal of the project is to visit each of the latitude and longitude integer degree intersections in the world, and to take pictures at each location. The pictures and stories will then be posted here." Accessed October 27th, 2002.

[39] My 1998 work net.art Sketch has some bearing on this thinking. http://www.thing.net/~beestal/sketch/sketch.html

[40] I admit to a great desire to visit the only unvisited confluence in the state of Nevada, USA, at 37°N 116°W. It is located less than 1000 meters from a blast crater created by U.S. above ground nuclear testing. http://www.confluence.org/confluence.php?lat=37&lon=-116

[41] Manovich, Lev, "Generation Flash", 4/11/2002, http://rhizome.org/object.rhiz?3426

[42] One aspect of C5's eco-challenge project is the study of collaboration models in team dynamics, search and navigation. http://www.c5corp.com/venues/ecochallenge/index.shtml

[43] Such as the SDTS standard, http://mcmcweb.er.usgs.gov/sdts/

[44] Much like the frame placed on 'digital photography' by Adobe PhotoShop.

[45] For example, the GIS aspects Masaki Fujihata's Impressing Velocity, http://www.c3.hu/~masaki/proposal/index.html, http://www.zkm.de:81/~fujihata/iv99.html