Interface and Interpretation

We tend to think of graphical interface as the screen display, a portal into the online world with menu bars, buttons, and icons to manipulate. As a result, we ignore its graphicality, its constructedness, the very features that support its operations and make it work.
We look at interface as a thing, a representation of computational processes that make it convenient for us to interact with what is "really" happening.
But the interface is a mediating structure that supports behaviors and tasks.
It is a space between human users

and procedures that happen according to complicated protocols. But it also disciplines, constrains, and determines what can be done in any digital environment.

Because engineering sensibilities have so dominated human-computer interaction, few attempts at humanistic approaches to design have come into play. Not only are there sparse precedents for humanistic interface, but the very principles on which its design might proceed are not clearly outlined. The one place we can look for substantive precedents is the long history of writing in humanistic traditions. Describing a codex book as an interface is glib if taken too literally. But just as the graphical user interface should not be thought of as a thing—reified, fixed, and stable—but as a mediating apparatus, so the graphical features of the book should be understood as a spatially distributed set of graphical codes that provide instructions for reading, navigation, access, and use. Creating a continuum between electronic and print formats and their features provides another useful synthesis of historical materials and future project design. A brief look at the history of interface design, interface theory, challenges for humanistic approaches to design, and the lessons to be taken from bibliographical study will put a foundation in place. On this basis we may move back and forth between a notion of *mise en page* as design of composition, format features, graphical elements in electronic and print media, and a notion of *mise en scene* or *mise en système*—an environment for action.

History of interface

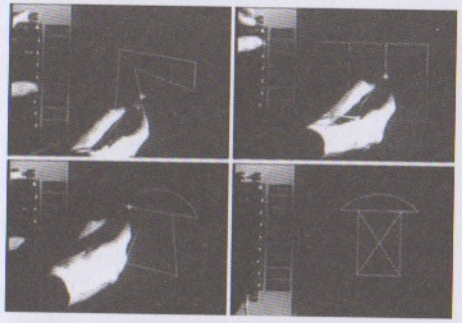
We can gesture toward all sorts of historical examples: switches and punch-cards, keyboards and all the many handles, knobs, and inputs by which we interact with objects in

the world, or remediate communication into code. But in actuality, interface is a concept to which we have only paid attention for about fifty years. The term comes into play early in the process of computational design. The pioneering work of flight simulators, of head gear and foot pedals, and other apparatuses that would discipline the body to conform to a regime of screen-based and device-driven affordances made the discussion of relationships of human to machine into a field known as HCI.[205] These cockpit simulators involved the notion of distributed cognition, the realization that many aspects of embodied sensory and motor activity contribute to experience and knowledge.[206] Morton Helig's 1962 *Sensorama* bicycle and Myron Krueger's 1960s experiments with light-and-media ("Glowflow" and "Metaplay" experiments, and his essay "Video Place and Responsive Environment") both emphasized the role of the body as an interface in ways that virtual reality pioneer Jaron Lanier picked up on in his designs meant to trick the entire sensorium into an illusion.[207]

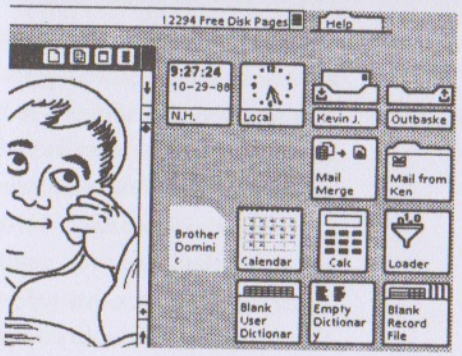
Microsoft Flight Simulator interface (2004).

In the late 1960s, when the only computer interface available was the text-based command line, Douglas Engelbart designed a prototype mouse about the same time as his contemporary, Ivan Sutherland, was creating Sketchpad, the first attempt at a real-time drawing program.[208] In 1970, Sutherland created a crude head-mounted display as one of several experiments with virtual reality devices. These pioneers realized that no matter how powerful computers were, they would not get used unless human beings could have a more direct connection with them than through the tedious

communication of punch cards and switch settings. Engelbart and Sutherland were both engineers, tinkerers, whose approach to design combined imaginative innovation and the values of efficiency. The field of HCI gravitated toward engineers, not artists, and quickly became task-oriented, focused on feedback loops that minimized frustration and maximized satisfaction with mouse clicks and joy sticks and rewarding bells and whistles. In the 1970s, researchers at Xerox Parc, including Alan Kay, created a set of graphical icons grounded in the work of constructivist-oriented psychologists Jean Piaget and Jerome Bruner, who understood the constitutive and generative aspects of interface, not just the mechanistic features.[209] Visual conventions quickly established the language of interface iconography, first as a vocabulary of recognizable pictures of things, then as cues for their behavior and use.



Ivan Sutherland, Sketchpad (1963).



Star interface with desktop icons later copied and made ubiquitous.

Professional interface designers chunk tasks and behaviors into carefully defined segments and "decision trees" to abstract their use from any hint of ambiguity. They analyze "user needs" into "functional requirements" in which concepts of "prototype," "user feedback," and "design" are locked into iterative cycles of "task specification" and "deliverables."[210] This language does not come from a theory of interface, but from

a platform of principles in the software industry. Deliberately mechanistic, it promotes the idea of a "user" instead of that of a humanistic "subject." Ben Shneiderman, whose justly renowned lab at the University of Maryland has been responsible for many trend-setting innovations, created "Eight Golden Rules" for interface design.[211] These were based on experiments testing short-term memory, capacity to follow cues from one screen to another, and so on. Common sense rules like "permit easy reversal of actions," have come to guide interface design as a result. Shneiderman's "user" is mainly a consumer, one who needs to be satisfied and kept engaged. His approach is grounded in the engineering, problem-solving pragmatism characteristic of the HCI community.

From these innovative beginnings came a robust industry that brought mass-market devices into production that were dominated by either Windows or Desktop metaphors.[212] The world divided into those who wanted to look *through* and those who wanted to look *at* their displays. More sophisticated object-oriented programming allowed icons to mimic behaviors of things they resembled so that a file folder could actually "open" on screen. The virtual performance was analogous to the physical one.

In addition to making use of different metaphors, interface design has followed several dominant models or ways of organizing communication with a user. An interface can express content, by presenting the intellectual structure of the site, repository, edition, or project for which it serves as portal (images, maps, texts, etc.). Or it can provide a set of instructions for actions and behaviors in the site by offering labels for tasks (search, browse, enter, view, login, contact us, etc.). Jesse James Garrett condensed the contrast between these two into a much cited graphic.[213] Garrett summarizes this fundamental duality between the web as an information

space and as a task-supporting environment. His observation that the difference between these conceptions leads to confusion in design has implications for interface design in the basic tension between a rational organization of content and the need to balance this with an intuitive way of using that content. Interface is the space between these two—it is neither the transparent and self-evident map of content elements and their relations, nor is it simply a way to organize tasks. The two are as intimately related as the reading of a text in a book is governed by its graphical organization and the specific individual reading experience produced as a "performance" of that environment. [See Window 7, interface design]

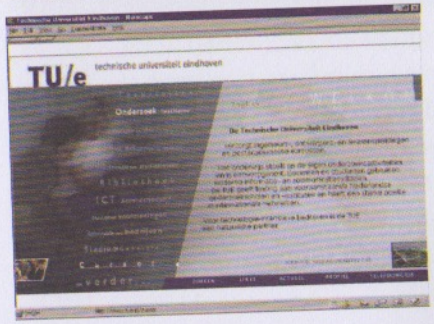
A full theory of interface goes beyond the design of information structures and tasks into the realization that these are only the armature—not the essence—of that space of provocation in which the performative event takes place. And yet, we know that the structure of an interface *is* information, not merely a means of access to it. The search and the query modes are what I see. Sliders, for instance, with their implication of a smooth continuum, impose a model of what information is through their expression of how to manipulate a value, while a dialogue box that asks for a keyboarded number imposes an equally rigid model of discrete values. When we are looking for dates for travel, it will make an enormous difference whether we are able to state our request in discrete or continuous terms. Interface designers are fully versed in the strategic variables according to which information needs to be structured to be manipulated effectively.

Interface design has to take cultural differences into account. Pioneering work by Aaron Marcus and Associates studied web pages and their relation to various cultural factors.[214] Building on work by sociologist Geert Hofstede, they looked at the ways cultural value systems are expressed in

The concept of "high power distance" defined by Aaron Marcus and Geert Hofstede, *Cultural Dimensions and Global Web Design* (2001).

"Low power distance" defined by Marcus and Hofstede in *Cultural Dimensions and Global Web Design* (2001).

web design. Hofstede's categories, whatever quibbles they provoke, provided a way to look at design features across cultural categories such as different degrees of tolerance for ambiguity and uncertainty, greater value placed on individualism or a preference for collectivism, or different degrees of dissatisfaction with inequalities in power relations. Marcus and his associates showed that these features find expression in the graphic organization of information. Interactions with interface would, presumably, exhibit some similar features, though Marcus's group did not look at movement through the information structures or at the web architecture to see if that held true. If we look at web-based design, however, the navigation paths, search and query results, browse features—in brief, every aspect of the web content management and display—embody values, even if these are largely ignored or treated as transparent or invisible.

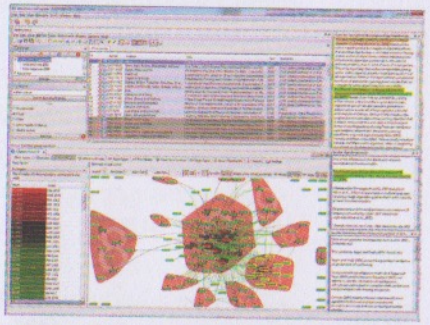


For the HCI community, the notion of a continuum of experience, within and structured by engagement with the interface, is never broken by engagement with representational content. So long as we think of interface as an environment for doing things, performing tasks, work, structuring behaviors, we remain linked to an idea that "reading" the digital environment is restricted to an analysis of its capacity to support the doing of tasks. This suggests that in

terface work is happening on what we would call a plane of discourse, or the level of the telling, rather than the told. The notion of HCI is that the single "frame" is that of the user experience. Thus a mantra like Shneiderman's "Overview first, zoom and filter, details on demand" assumes that one is working in a very restricted, highly structured, bounded, and discrete environment.[215] For interactive database design, his approach makes sense, since there the interface is a way of displaying search results that come from the combination of variables or filters. Dynamic information visualization flattens the planes of reference, discourse, and processing so that they appear to be a single self-evident surface. The naivete of that approach is easily critiqued: it is semiotic child's play to take a graphical interface with sliders, windows, dials, and variables and demonstrate that it is an expression of motivations, agendas, and deliberately concealed factors, no matter how earnestly or usefully it may serve a specific purpose. This is true whether we turn our critical attention on Travelocity, Yahoo, Flickr, or Lifelines2 and its display of "temporal categorical patterns across multiple records."

Action Science Explorer, complex data integration interface.

Lifelines interface, timeline created from experiential data.



The human factors and HCI communities work to design effective environments, ones in which satisfactions are balanced with frustrations, and efficiency can be maximized. Their focus is on the literal structure of the design, the placement of buttons, amount

of time it takes to perform a task, how we move through screens, and so on. In "The Theory Behind Visual Interface Design," Mauro Manelli lays out a comprehensive mechanistic approach to the stages of action involved from "forming an intention" and "specifying an action" to "evaluating the outcome."[216] Manelli's approach reflects on the design process in relation to a concept of "user experience" that approaches to map structure and effect directly. This is akin to doing close readings of a text's formal features as if it locked that text into the reading. We need to theorize interface and its relation to reading as an environment in which varied behaviors of embodied and situated persons will be enabled differently according to its many affordances. This shifts us away from the HCI world, and the interface, into fields closer to graphic design and media theory, an important move in reading and designing interface.

Considerable distance separates the interface design community and that concerned with critical theory. Interface theory has to close that gap.

Interface theory

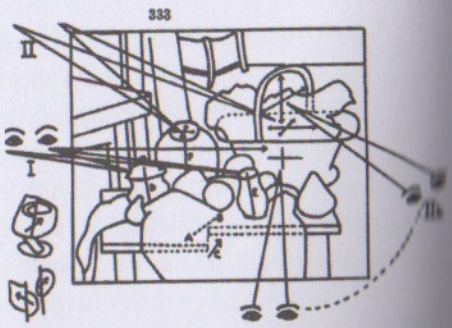
From a humanist perspective, our understanding of digital interface should build on critical study of the subject in literary, media, and visual studies. We need a theory of the ways interface produces subjects of enunciation, not users as consumers. The HCI "user" combines two ideological illusions in a single paradoxical identity: the predictability of a mechanized automaton and the myth of autonomous agency. Humanistic approaches to interface need to recuperate the theoretical formulation of subjectivity as a part of the enunciative apparatus, of positions spoken, articulated, created by

the structuring and desiring machines of representations. The legacy of a half century or more of theoretical discourse is available for this work, ready to be brought back into play. Who is the subject of an interface? How are we produced as subjects of the discourses on the screen? And in our embodied and culturally situated relations to screens and displays? These are fundamental questions that precede the analysis of content models or knowledge design, questions addressed to the very situation in which such models are located and used as instruments, consciously or not, of institutionalized relations of power. This is familiar language, the recognizable critical discussion of ideological formations as they work through individual subjects through the codes and features of mediated representations—language, image, ritual, spatial relations, and other cultural systems.

In 1989, Norman Long, a sociologist, described interface as "a critical point of interaction between life worlds."[217] Twenty years ago, Brenda Laurel defined interface as a surface where the necessary contact between interactors and tasks allowed functions to be performed.[218] She noted that these were sites of power and control, infusing her theoretical insight with a critical edge lacking from the engineering sensibility of most of the HCI community. Interface is a dynamic space in a psychoanalytic sense, not just a psychological one. Like any other component of computational systems, it is an artifact of complex processes and protocols, a zone in which our behaviors and actions take place, but it is also a symbolic space in which we constitute ourselves through the experience of its particular structures and features. Interface is *what we read* and *how we read* combined through engagement, it is a provocation to cognitive experience, but it is also an enunciative apparatus.

"Task optimization" is a watchword in the interface

community, largely as a result of Jakob Nielson's work on web usability in which interface mediates between information structures and user needs.[219] But the "enunciated subjects" of interface mentioned above have had little critical play by contrast, and the humanistic agenda can go a step further. A humanistic subject leaves a trace on the emerging, mutating environment of an interface. The crucial definition of human subjectivity is that it can register a trace of itself in a representational system, and that self-recognition and self-constitution depend on that trace, that capacity to make and register difference. The encounter between a subject and an interface need not be understood mechanistically. We can think beyond representational models to understand interface as an ecology, a border zone between cultural systems and human subjects.



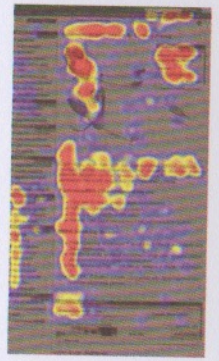
Erle Loran, diagram showing point of view systems structured into a Cezanne painting, *Cezanne's Composition* (1943).

Lisa Snyder, Perspective rendering of virtual reconstruction of Columbian Exposition of 1893.

Rather than being user-centered, a humanistic design approach is subject-oriented. Such an approach would not just include accommodation to whim, preference, habits of thought, customs of taste, and differences of reading. After all, even the most empirical clinical studies show that we don't read mechanistically. Eye tracking experiments support the "production" of an interface and its "producing" effect in

a reader/viewer as surely as any theoretical deconstruction of reading as information transfer.[220] An interface launches a probabilistic missive in the direction of a user/reader, but the reading is always an act of self-production and of textual deformation. But subject-oriented interface includes recognition that a point of view system is in place, that a subject enunciates, produces, a constitutive perspective in which she is situated, made, and from which she perceives. Point of view structures the world and positions us in its representations. All images have a point of view. They are all drawn from some place in relation to what is shown. Perspectival systems position a stationary viewer whose cone of vision is transected by a plane.[221] Orthographic systems assume a viewer positioned at equal distances from each bit of the observed object, an unrealizable fiction, but a useful one. The screen space—and subdivided spaces within it—each assume a relation to the viewing subject whose gaze is expected to produce an experience of the world within its frames.

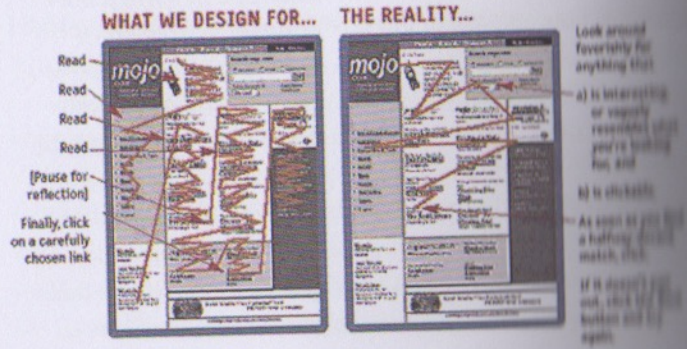
So prevalent have notions of interface become that cognitive scientist Donald Hoffman has taken them as the founding image of his "Interface Theory of Perception."[222] He argues against representational models of perception, stating that animals do not represent the world to themselves in a truthful or veridical way, but through what he terms "icon models." Our relation to our environment is adaptive, mediating through the abstraction of an interface that supports "sufficing" behaviors. The icon models organize our behaviors rather than representing the world. A good example is the model of "real time" that we project onto computer interfaces and their refresh rate. Nothing about that metric is "real," except that it describes the limit of our perception of temporal units, the point at which we cannot perceive delay. But because the metaphors of screen environments are so



Nielsen Norman Group, eye tracking results, "F-Shaped Pattern for Reading Web Content" (2006).

familiar, we do not see them as models, but simply cues for actions. Similarly, we take little notice of the way screen spaces already address us, speak us by organizing the discourse of their display according to expectations of who is using a particular interface. As surely as point of view systems in visual works embody the subject whose position organizes the work around their gaze, so interfaces are constitutive environments that model experience through experience. And as in any enunciative system, our subjectivity is as much an effect of what we cannot say, what cannot be done, the constraints on behavior and imagination, as of what we do and can perform directly. The old spectre of "disciplinary regimes" that order relations of power rises immediately into view in taking the measure of interface design.[223]

Gestalt principles can certainly be used to read a graphical user interface.[224] But we should also make use of the terms of theatricality and identification laid out by media theorists in their analyses of the ways viewers are absorbed into the flow of digital and online environments.[225] For decades, these theoretical formulations have taken into account the structures of the gaze, the identification with the situation of viewing, the production of subject positions in relation to the act of engagement with media as well as the con-



Steve Krug, from *Don't Make Me Think* (2005).

tent of representation. Fundamental questions arise about who speaks and who is spoken. The place from which a discourse is produced is often erased. In whose interest is it to efface the origin of a discourse so that it naturalizes the production of information on the screen? The display simply appears to be "there" and we "simply" seem to absorb it. We pick and choose from a menu whose design we do not question because it seems neutral. These positions begin to chip away at the premises on which actor-network theory works, since it assumes the discrete autonomy of the actor/agent distinct from the network. That very concept is mechanistic, and at odds with the integrative co-dependencies that are essential to a critical humanistic understanding of interface. Instead of a boundary, or "between" space, an interface becomes a codependent in-betweenness in which speaker and spoken are created. The idea of a performative interface follows immediately from this, and serves well to expand a humanistic approach.

The standard theory of interface, based on the "user experience," is reductively mechanistic. Its goal is to design an environment to maximize efficient accomplishment of tasks —whether these are instrumental, analytic, or research oriented—by individuals who are imagined as autonomous agents whose behaviors can be constrained in a mechanical feedback loop. Challenges to that conception arise from within the information studies community—where interface is embedded in the motivations of an embodied user engaged in some activity that may or may not be goal oriented, highly structured, and/or driven by an outcome—but might equally be the diversionary experience of wandering, browsing, meandering, or prolonging engagement for the purpose of pleasure or an even lower level notion like keeping boredom at bay or idle distraction and time squandering. This

aesthetic paradigm has had its advocates such as aesthetic theorist Roy Ascott, artists like those who comprise jodi.org, or new media artists like Casey Reas, Scott Sona Snibbe, or the host of others whose work populates analog and digital gallery and exhibit spaces.[226] In their work, aesthetic dimensions and imaginative vision make interface a space of being and dwelling, not a realm of control panels and instruments only existing to be put at the service of something else. The jodi projects were often disruptive, disorienting, frustrating in their defeat of expectations—and thus their undoing of conventions of user and task. Snibbe's work engages users through interaction and remediation, taking data into graphic form so it can be manipulated, played with, and thus take the viewer by surprise.

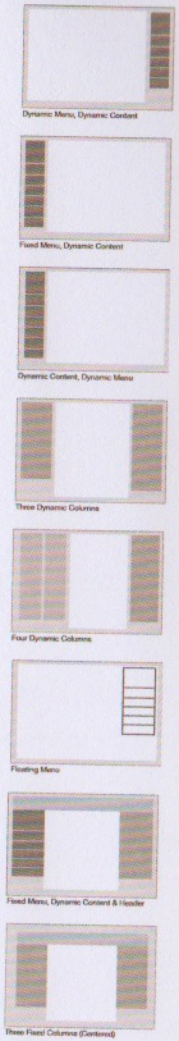
I bring up these contrasting communities because they challenge the illusion of interface as a *thing*, immediately making it clear that a theory of interface cannot be constructed around expectations of performance, tasks, or behaviors.

Reading interface

Web environments are more mutable and modular than films, and the analogy between old media and new breaks down when we realize that all segments of film, no matter how radically they are spliced and combined, are segments of the same order of thing.[227] They may, and do, require significant jumps in cognitive framing, but they are part of the same modality: film texts/sequences. All film segments and video segments unfold according to the same set of temporal principles: continuous and forward moving in a unidirectional manner. But the temporalities of web environments are varied. They don't conform to a single mode. The refresh

rate of headlines, stories, videos, ads, banners, pop-ups, stories, other reports, links, and user contributed information are all different. But also, the ways our bodies engage with these are distinct at the level of manipulation and cognitive processing of the experience.

If I watch an embedded video, track events on a map that zooms, scales, and shifts between a schematic map to a street view with its photographic codes while I am reading through a text, following links, opening a series of windows, and so on, then what is it that constitutes the interface? And what organizes the relational experience? Unlike the controlled experience of viewing a film, reading a graphic novel, or even performing the discontinuous reading of a book or newspaper, this experience has no a priori unifying ground on which the fragments relate. The exterior frame of a graphic novel, the defining frame that delimits its boundaries, has more porousness and more fragility in a web environment. We note the limits of a site or repository, which may have the isolation and autonomy of a silo. But in most web environments, we are reading across a multiplicity of worlds, phe-



Web page frame conventions.

TheAtlantic.com frame structure.

nomena, representations, arguments, presentations, and media modalities. The way we make connections across these disparities is different than when we work in a single delimited frame. The points of connection are perhaps best described in terms of mathematical figures and architectural spaces: as nodes, edges, tangents, trajectories, hinges, bends, pipelines, portals. These are not the language of old media transferred to new, not a language that derives from theories of montage or cuts, editing or pastiche, allegory or appropriation. Instead, these are structuring principles that refer to the constitutive nature of interface experiences of reading.

Reading was always a performance of a text or work, always an active remaking through an instantiation. But reading rarely had to grapple with the distinctions between immersion and omniscience—as when we are experiencing the first person view of a video juxtaposed with manipulation of a scalable map, with watching the social network reconfigure itself around a node of discourse even as the node is changing. Digital environments increasingly depend upon a whole series of contingent texts, transient documents, that are created on the fly by search and query, filtered browsing, or other results-based displays that last only a few moments on the screen in the stepping-stone sequence of user clicks that move from one ephemeral configuration to the next. In addition, the scale issues of reading across large corpora have produced numerous data mining approaches for distant reading, a term made popular by Franco Moretti. Like Lev Manovich's cultural analytics, the approach depends on analysis of information in the digital files to present patterns of theme, sentiment, or other values at a scale impossible for human readers. Such projects often contain more hours of audio, visual, textual, or video files than could be looked at by a single individual across the span of a lifetime. Reading is

thus augmented by computational capacities, though the questions of meaning and value, and of the specific identity of those digitally produced surrogates and syntheses, pose new questions about the nature of reading and role of interface as provocation.

The dynamic nature of the interface environment reconfigures our relation to the act of reading, ratcheting up the insistence on a constructivist approach that understands perception as a constitutive act. Countering traditional notions of perception as a species' ability to "address the true properties of the world, classify its structure, and evolve our senses to this end," Hoffman suggests that perception is a "species-specific user interface that guides behavior." Like the Chilean biologists Francesco Varela and Humberto Maturana, he demonstrates that no experience exists a priori, the world and its reading come into being in a codependent relation of affordances.[228] The new affordances of web-based reading are not distinct from this, they are not another order of thing, a representation already made and structured, but a set of possibilities we encounter and from which we constitute the tissue of experience. The constitutive act, however, in this new environment puts our bodies—eyes, ears, hands, heads—and our sensory apparatus into relation with rapidly changing modes. The integration of these into a comprehensible experience seems to have emerged intuitively, since the frames within frames of the web interface provide sufficient cues to signal the necessary shifts of reading modes.

Erving Goffman's frame analysis is particularly relevant to the processing of a web environment where we are constantly confronted with the need to figure out what domain or type of information is being offered and what tasks, behaviors, or possibilities it offers.[229] To reiterate, on its own a typology of graphical elements does not account for the ways

in which format features provoke meaning production in a reader or viewer. The cognitive processing that occurs in the relation between such cues and a viewer is not mechanistic, predictable, or linear, but probablistic. Graphical features organize a field of visual information, but the activity of reading follows other tendencies. These depend on embodied and situated knowledge, cultural conditions and training, the whole gamut of individually inflected and socially conditioned skills and attitudes. Frame analysis is a schematic outline that formalizes certain basic principles of ways we process information into cognitive value or go from stimulus to cognition. Filling in the details of ideological and hegemonic cues, or reading specific artifacts as a production of an encounter—the production of text (reading) and production of a subject of the text (reader)—is a process that depends on specific cases. But the generalized scheme of frame analysis puts in place a crucial piece of our model of interface: the recognition that any piece of perceived information has to be processed through a set of analytic frames that are grounded in cognitive experience *in advance* of being read as meaningful. We have to know where we are in the perceptual-cognitive loops—what scale the information is and what domain it belongs to, for instance—before we can make any sense of it at all.

In a networked environment, such as an iPhone for instance, the literal frames of buttons and icons form one set of organizing features. They chunk, isolate, segment, distinguish one activity or application from another, establishing the very basis of expectation for a user. Engagement follows, and then returns to the interface in an ongoing process of co-dependent involvement. But "frames" are not the same as these conspicuous graphical instances. Once we move away from the initial menu of options and into specific applica-

tions or digital environments, a user is plunged into the complex world of interlocking frames—commerce, entertainment, information, work, communication—whose distinction within the screen space and interface depend on other conventions. For scholarly work, the ultimate focus of my inquiry, the relation among frames is integral to the relations of what are traditionally considered text and paratext. In a digital environment, those relations are loosened from their condition of fixity and can be reorganized and rearranged according to shifting hierarchies of authority and priority. A footnote to one text becomes the link to a text which becomes the primary text in the next window or frame, and so forth.

The basic tenets of frame analysis depend on a vocabulary for describing relations (rather than entities). Frames by definition depend on their place within a cognitive process of decision making that is sorting information along semantic and syntactic axes, reading the metaphoric value of images and icon as well as their connection to larger wholes of which they are a part. In traditional frame theory certain behaviors are attributed to relations between frames. A frame can extend, intensify, connect, embed, juxtapose, or otherwise modify another frame and perception. The terminology is spatial and dynamic. It describes cognitive processes, not simple actions of an autonomous user, but codependent relations of user and system. In invoking frame analysis as part of the diagrammatic model of interpretation, we have moved from a traditional discussion of graphical formats as elements of a *mise en page* to a sense that we are involved with a *mise en scene* or *système*. This puts us on the threshold of interface and a theory of constructivist processes that constitute the interface as a site of such cognitive relations. Interface is not a thing, but a zone of affordances organized to sup-

port and provoke activities and behaviors probabilistically, rather than mechanically. Only by taking into full account the constructivist process of codependence that is implicit in frame analysis have we been able to move from a simple description of graphic features—as if they automatically produce certain effects—to a realization that the graphical organization only provides the provocations to cognition. They constrain and order the possibilities of meaning producing conditions, but do not produce any effect automatically. In fact, the very term "user" needs to be jettisoned—since it implies an autonomy and agency independent of the circumstances of cognition—in favor of the "subject" familiar from critical theory. Interface theory has to proceed from the recognition that it is an extension of the theory of the subject, and that therefore the engineering approach to interface that is so central to HCI practitioners will need some modification.

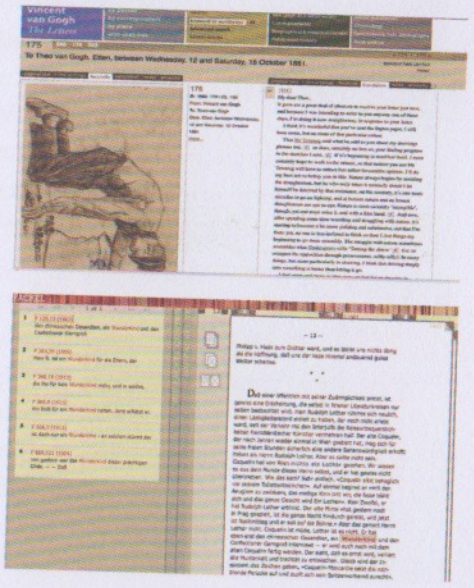
Humanistic interface

Before we launch into speculation, however, and offer a vision for reconfiguring arguments into constellationary form using the techniques of semantic web, topic maps, network diagrams, and other computational means of visualization and spatializing relations among units of thought, we should pause to examine a few striking instances of interface design that incorporate humanistic principles in their organization. One way this is accomplished is for an interface to express a content model that comes from critical study, editing, bibliography, or other traditions rooted in the appreciation and engagement with cultural materials. The Van Gogh Correspondence project is exemplary in this regard, offering a view into the repository that is structured by categories that

emerge from the material.[230] Correspondents have senders and receivers, they have places from which they originate and to which they are sent. Van Gogh's letters contain images, sketches, which are often related to paintings or other works, larger projects, and their development. The site features the facsimiles of the letters and their transcriptions in versions that respect their lineation as well as translate them into multiple languages for broader access and use. The fundamental considerations structuring the interface arose from the belief that these aesthetic materials would be studied, used, and analyzed, not consumed. The Austrian Academy's *Die Fackel* archive, a completely transcribed, marked-up, analysis of the work of the cultural critic Karl Kraus allows for faceted search and browsing of the entire run of the journal from 1899 to 1936.[231] The design of the interface, created by Anne Burdick, uses subtle choices in color palette, typography, and graphical features to push the substantive content of facsimiles, search results, and transcription/analysis into the foreground. The complex navigation and orientation features that guide a reader and show where he or she is at any moment relative to the archive as a whole produce a structuring effect that is situated within recognizable frames. At every point we know where we are, how we arrived, and how to move around while making use of the analytic features built into the project. If the Van Gogh project expresses a model of humanistic content, the *Die Fackel*

Interface design for the Vincent Van Gogh Letters Project.

Anne Burdick Design, *Die Fackel* web site design.

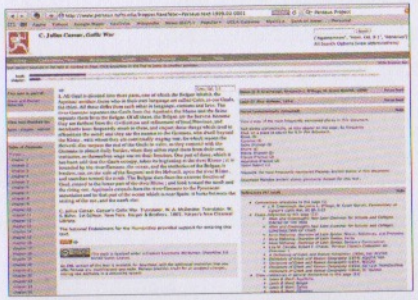


Greg Crane, interface for the Perseus Digital Library.

Interface for the Encyclopedia of Chicago.

project creates a humanistic environment that supports question, analysis, and study.

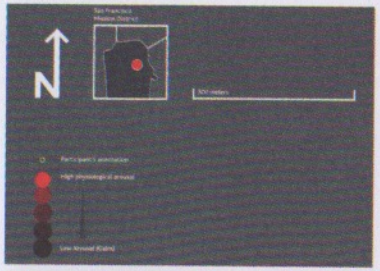
Two other exemplary projects are Greg Crane's long-standing Perseus library of classical materials and the Chicago Encyclopedia.[232] These offer a very different user experience through their argument structure and knowledge design. They share certain features, in particular, a rich information infrastructure that cross-references terms, concepts, keywords, sources, citations, and indices. Each is designed to allow multiple kinds of use and pathways, views into the data and content, through analytic process as well as reading experiences. Neither has a single voice or narrative that organizes the whole into a linear presentation, though either may be used to read documents and interpretative materials in a linear way. Each optimizes, sometimes minimally, the use of graphical organization for navigation and orientation. The distinctive features that ground these interfaces and sites in a humanistic inquiry is the combination of content models derived from humanities content and the conviction that individual reading and study make the experience anew in each instance. The interface supports production of reading, rather than consumption of experience.



Taking humanistic principles one step further, the artists Jonathan Harris and Sep Kamvar's project, *We Feel Fine*, registers participants' engagement by harvesting indicators of emotional states from

publically available Twitter feeds, Facebook postings, and social media of all kinds.[233] The site is a pulse, an indicator, a living system in which collective emotional life is registered. The faceted search allows a viewer to select various criteria from demographic data banks and get a read on the state of mind of a defined segment of the population. Because the data is constantly refreshed and updated, the user can be part of the feedback loop that generates the next round of response. Obviously issues of scale play a part, and no individual user makes a statistically significant difference, but that the system is driven by the constant recalibration of expressions of emotional experience gives the project humanistic resonance. This dimension, of registering affective qualities of human experience, extends the mechanistic boundaries of computational processing into a dynamic relation with living beings whose continually differentiating experience is its lifeblood and core. As the force and shape of interpretation begins to register on the humanistic corpus that contributes to the many streams of cultural material, incorporating these processes of assessment and reflection has the potential to produce new ways of gauging and engaging with the affective experience of being human.

Christian Nold, biomapping, from *Emotional Cartography* (2009).



Lessons from bibliography

Not only is it interesting to think about the book as an interface, but we can build on those insights for understanding how interfaces actually work. As is the case of screen interfaces, we

tend to see the features of a book page as things, rather than as cues for reading and use. The purpose of headers, footers, page numbers, margins, gutters, indentations, tables of contents, indices, and every other bit of text and paratext is to structure our reading. Solid blocks of undifferentiated text would be difficult to digest, even though this was the earlier condition from which the conventions of the codex as we know it have emerged.

All of the graphic features of the book have functions. They work as presentation (what's inscribed and present), representation (content of a text and/or image), navigation (wayfinding across the spaces of the book), orientation (sense of where one is in the whole), reference (into the sources and conversations on which a work is drawn), and social networking (the dialogues of commentary, footnotes, endnotes, and marginalia). Just like a web page, a book is a site of social exchange. Its apparent stability and fixity are an illusion. A book is a kind of snapshot across a stream of exchanges and debates, especially a scholarly book. The dynamic properties usually attributed to new media are already active and present within older forms.

But where, when, and how did this scholarly book apparatus emerge?

When the codex book form first appeared in the second and third centuries of the Common Era, the design of its page spaces drew on habits established with scrolls and tablets for the arrangement of text in lines and columns.[234] In these, as well as in manuscripts, we see many instances of graphical syntax that is semantically coded, such as basic reading order and direction. In the early centuries of the codex, its textual inscriptions lack almost all other scoring features. There were no spaces between words, no punctuation, no apparatus for searching or organizing a text, no call outs,

no headers, no subheads, no tables of contents, no indices. Texts supported continuous reading, but not searching or discontinuous use.

Schematic organizations gradually emerged to distinguish what we would call content types, or different aspects of texts, sorted by their identities, as captions, chapter titles, notes, and the like took on distinct roles and graphical forms. In his struggle to establish the authority of biblical texts, the third century scholar Origen created structured graphic devices to organize his work.[235] A multi-columned table (*hexapla*) that resembled an editorial spreadsheet was used to compare variant texts. Other conventions, such Canon tables that make use of architectural motifs to create and reference structural divisions of space, served as mediating interfaces to

Codex Sinaiticus (mid-fourth century), British Library.

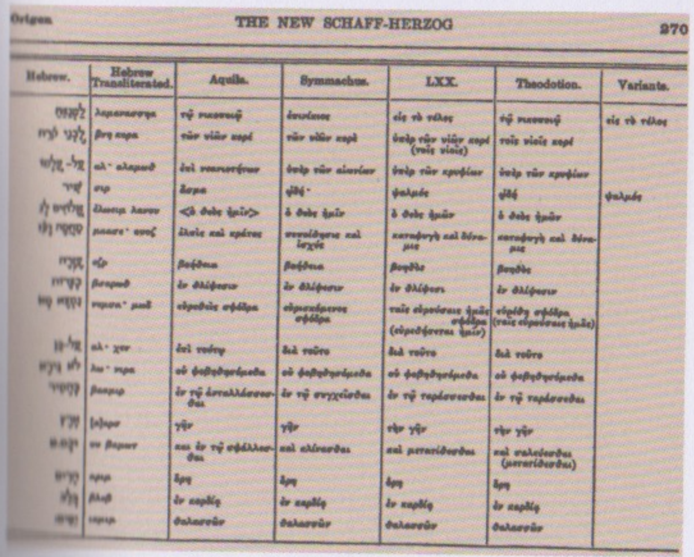
Canon tables, Book of Kells (circa 800).

match passages and references in Gospel texts. Similar tabular structures were then used to order other kinds of information, such as the contents of almanacs or chronicles. The very act of ruling a vellum or parchment sheet creates a grid structure whose reasoned syntax may be put at the service of various knowledge representations.[236] Books are structured spaces as surely as web pages with their wireframe organization.

According to the medievalist Malcolm Parkes, the scholarly book as we know it assumed its familiar form between the twelfth and fifteenth centuries.[237] This was an era of cultural transformation with regard to knowledge and the technologies for its creation and dissemination. In the emerging intellectual centers of Spain, France, England, Italy, and Portugal, increasing professionalization, interest in secular knowledge and canon law, and changing conditions for urbanization gave rise to universities as self-regulating communities that were sanctioned either by civil or religious entities. The earlier, almost exclusive claim of monasteries to serve as the centers of knowledge production and preservation in the West began to dissolve after the twelfth century. The establishment of new mendicant orders, Dominicans, Franciscans, in the early thirteenth century created a need for new, different, scholarly resources. Itinerant preachers wanted a single, all-purpose book that could be carried and used extensively as a reference work—it was also all they could afford. Their needs in part restructured the format of the scholarly book.

In "The Influence of *Ordinatio* and *Compilatio* on the

Development of the Book," Parkes writes: "The late medieval book differs more from its early medieval predecessors than it does from the printed books of our own day. The scholarly apparatus that we take for granted—analytical table of contents, text disposed into books, chapters, and paragraphs, and accompanied by footnotes and index—originated in the applications of notions of *ordinatio* and *compilatio* by writers, scribes, rubricators of the thirteenth, fourteenth, and fifteenth centuries."[238] In detailing the conditions under which these features come into being, Parkes traces changes in reading practice from a monastic *lectio* that was meditative and linear to a scholastic one that was active, non-linear, characterized by cross-referencing, synthesis, and argument. Thus the changes in "mise-en-page of texts were bound up with the developments in the methods of scholarship and changes in attitudes to study." Earlier codices used a format that had little textual apparatus surrounding it, because no perceived

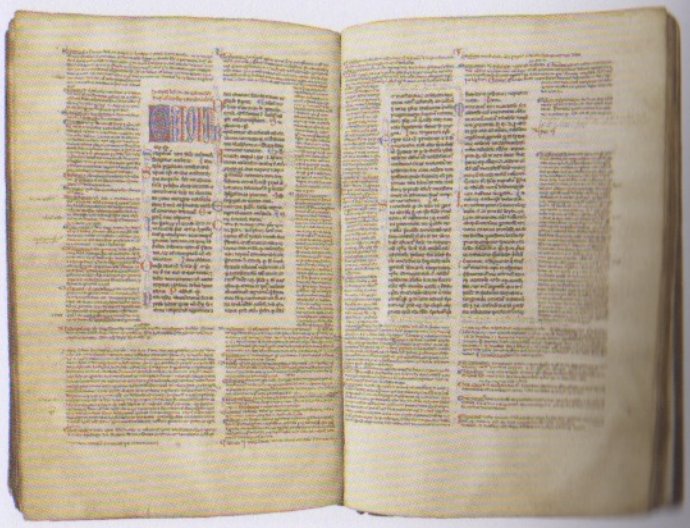

Origen THE NEW SCHAFF-HERZOG 270

Hebrew.	Hebrew Transliterated.	Aquila.	Symmachus.	LXX.	Theodotion.	Variants.

Hexapla for critical editing, *The New Schaff-Herzog Encyclopedia of Religious Knowledge* (1908-1914).

need existed. Elaborate commentaries and glosses made use of graphical means for distinguishing different orders of text. These visual distinctions also support navigation through a bound book, with call outs, headers, and other features assisting the practice of discontinuous reading. In addition to helping locate specific chapters or verses, these new paratexts made it possible to sustain a scholarly system of reliable citation. The advantages of graphical organization became readily apparent and were copied extensively as well as expanded.

Once the conventional features of page layout are understood as elements developed to serve functions, their design goes beyond harmonious layout or pleasing proportions. The page structures conventionalized in medieval manuscripts are adopted into printed books and digital documents. They permit clear encoding of the relations of text to commentary, text to paratext, and apparatus to the whole space of the book. In digital formats, some of these features



Decretals of Pope Gregory IX with the Gloss of Bernard of Parma (second half of thirteenth century).

are imitated without understanding the purpose that they served, and without understanding that orientation and navigation are features of the codex that have yet to be worked out systematically in digital documents. So conventionalized are the elements of texts and their codified relations that we author with those structures in mind. A table of contents, added at the end of a project as if it were the summary and introduction to the whole, is both a fiction and a highly formula-driven piece of writing. The text has to be produced in conformance with expectations, composed under graphical constraint. Footnotes point outward to the discourse field of textual production, to the communities with which an author is in dialogue. These find their way into sidebars and hyperlinks, even as other conventions have quickly arisen in the organization of screen space that guide its allocation to different purposes according to positions. Just as a running header on a page or a page number on the outside edge is a device whose presence arises from use, so equivalents in digital environments have been created on the basis of functionality, not just as graphical features. The aside, the comment, the marginal note, the index, and chapter heads or subheads, are part of our process of composition (and certainly employed in the processes of editing). They guide our writing in advance of reading. Or have. Things are changing. New writing modes are shaped by social media, by email, blogs, Twitter, and wikis. In these changing conventions the surface of interface often conceals the back-end technical and conceptual processes by which they are produced. Collaborative modes of writing, as in wiki production, absorb individual authors into texts at the word, phrase, and fragment level. Attribution and citation do not mark themselves on the front pages as a brand and introduction, but have to be sought in bylines or citation indices. Navigation and display are in-

creasingly intertwined as well, with analytic processing and data mining generating on-the-fly visualizations that can be used as points of entry to search, retrieve, or engage with the files represented onscreen. The rules are more complicated, less obvious, less accessible, at least for the present.

We rely on spatial specificity to organize written language (or multimedia texts, for that matter). As new functionalities begin to emerge in the modular and data driven organization of interconnected corpora, the features that have to be structured into designs for use are also changing. The tactile user interface supports scale changes, diving and drilling, expansion and compression, in ways that the material substrate of paper could only hint at.

The shift from manuscript page to layouts dependent on print technology reinforced tendencies toward squareness (quadrature) and invariant type size and style. These are not absolute requirements for printed pages, but production means—letterpress, linotype, phototype, and digital typesetting—were all designed to support these conventions. By contrast, for manuscript pages to contain lines of text that are evenly sized and spaced demands disciplined attention to the calligraphic tasks. The affordances of each medium are fundamentally different. The lower limits of micrographia are determined only by the ability of a scribe to manipulate the point of a pen, and insertion of one line after another into the space between two pre-existing lines of text is governed only by a principle of elasticity, not strict decorum. When we look at the elaborated commentaries that decorate the pages of manuscripts in the Middle Ages, when conventions of navigation, reading, and writing were being established as customs for use, we see the origins of our habits alongside the opportunities that had to be let go within the constraints of printed forms. Digital environments have imitated the

squareness of print, though in fact no feature in the technology determines this, just conventions of design and reading. Pad devices have integrated the scale-changing capacities of digital display, previously activated with zoom icons or percentage values, into the tactile interface. Conceptualizing conventions and roles for spatial relations among semantic elements in these modes goes far beyond the fantasies of hypertext that initially seemed to be the horizon of opportunity for the exploded or extended book.

Corpus Juris Canonici, vol. 2 (Rome 1582); UCLA Special Collections.

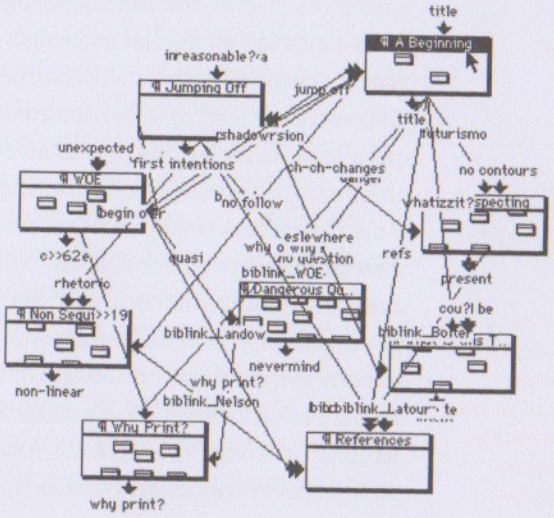
A striking instance of conventionalization appears in the rules governing the placement of interpretative texts in the published versions of commentary on the Torah, known as the Talmud.[239] The earliest printed editions were created in Venice in the 1480s.[240] The comprehensive commentaries of the late eleventh century scholar, Rabbi Solomon ben Isaac (referred to by an acronym based on his initials, Rashi), were placed in a regular position as the four lines in the uppermost right hand corner of the page.[241] This format was adopted by the sixteenth century printer Daniel Bomberg for his layout of the Babylonian Talmud. The design came into wide circulation in a format that continues in use to the present day.[242] The Talmud's graphical organization not only puts textual elements into a design structure that carries semantic value, it also encodes assumptions about the consensual system of knowledge production within a community. Reading practices are coded to

Page from the Vilna edition of the Babylonian Talmud (circa 1880).

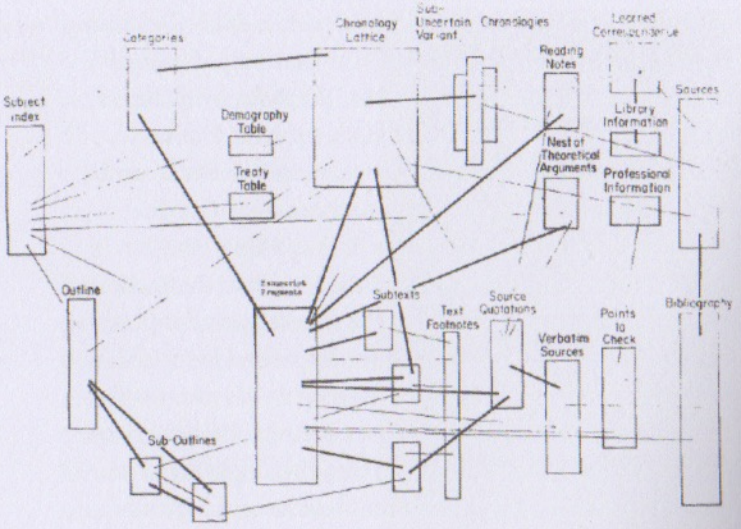
appeal to and signal a self-acknowledged and self-identifying group. The page serves as a specific site of mediation, a record of exchange within a tradition whose participants know and perpetuate its codes. They do not just know how to read the book, they know they are identified by its format as its implied readers. Similar observations could be brought to bear on other complex texts whose commentary and scholarly apparatus serve specialized fields of knowledge—law, religious doctrine, philosophy, and so on across varied disciplines of human inquiry—where the space of the page holds the conversation in place, marking its dialogues and exchanges, debates and contentious struggles. Printed and manuscript pages are and were their own snapshot of a continuum of socially networked exchanges. Their flexibility and mutability has much to offer to the current investigation of design for humanistic work.

The enthusiasm for innovation that came with the first wave of hypertext writing in the 1980s brought equal parts insight and exaggeration to the idea of creating imaginative works that played with diagrammatic features.[243] Earlier visions of branching narratives are usually tracked to Vannevar Bush's 1945 paper, "As We May Think," to the first works published by Theodor Nelson in the 1960s, or in some of the experiments of innovative writers who played with alternative

structures in analogue or digital work, such as Julio Cortazar in *Hopscotch*, first published in 1963, or the computationally generated text first published in 1984, *The Policeman's Beard Is Half-Constructed*.[244] Artists had made projects that used alternative physical and graphical structures—decks of cards, collage techniques, combinatoric processes—in analogue form since early Dada experiments in the 1910s.[245] But hyperbolic critical claims exaggerated the binaristic distinction between the linearity of print and the non-linearity of programs like Hypercard.[246] Designed for Apple and launched in 1987, Hypercard was a milestone, offering an easy to use platform for creating combinatoric works built in chunks whose sequence did not have to be locked into the single linear sequence. The possibilities seemed limitless. Branching and linking, the basic underpinnings of the web, were embodied in its programming. The structure of hypertext could be rendered in a diagram, as well as experienced as multiple pathways through the reading. Hypertext chunking allowed a conceptual separation between content types (such as footnotes, sources, citations, primary materials, and other elements) to be made more explicit in the storage, and thus manipulation, of these units. This modular quality served to break a text into narrative units for combinatoric play, with relations specified in links, or in a database structure.



Hypertext map from the early history of the World Wide Web (circa 1990).



These ways of working have become so integral to our daily practice that we barely pause to consider their structuring principles or effects.

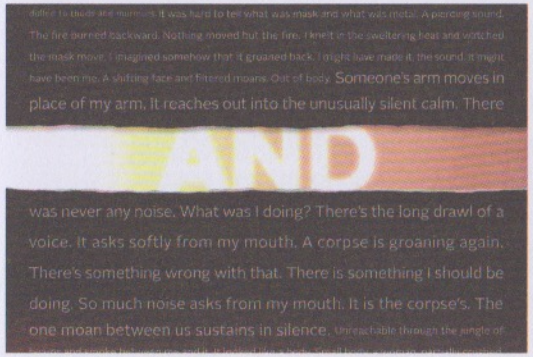
Now hypertext seems quaint, its tropes evoke nostalgia rather than future visions. Augmented displays and networked databases that produce real-time texts from protocols that are geo-spatially located, or triggered by data profiles and personae, or other automated processes, make hypertext seem like child's play in an early sandbox of digital imaginings. Nonetheless, our critical engagement with database rhetoric as a compositional mode lags behind. The notion of creating content types to undergird creative or even critical scholarly writing and shaping discourse production as an extension of data formats is only the province of a few experimental writers or scholars. Digital display and the behaviors afforded by APIs, application programming interfaces, have generated the aesthetic vocabulary that drives most new forms of textual production online. Back-end conceptu-

Ted Nelson, Xanadu file structure, devised in 1965, from "Back to the Future" (2007).

al thinking as a compositional method, with spatialized and graphical relations expressing semantic values, occurs only in rare or technical instances, usually performed by professionals in information fields or artists with programming skills. We have a way to go before a broader swath of the literate population has the compositional/computational skills to push beyond bibliographical conventions and into digitally driven design concepts.

The binarism stressed by early hypertext writers and theorists suggested that the compositional techniques that took up Jorge Luis Borges's image of the "garden of forking paths" heralded the arrival of a new era of literary liberation from the tedium of linearity imposed by conventions of print.[247] In pausing to think about the ways authoring absorbs and depends on provocations coded into the graphical space that maps relations among one bit of text and another, we are bringing questions about the authoring platforms and potential/*poetential* of electronic space into view. Formats in electronic space have reprised some of the older textual modes of production, even as these are interpenetrated with the now ubiquitous structure of cross references and linking. Blogs are scroll forms, social media sites are galleries, a list of tweets has diagrammatic codes, a Wiki divides its screen display into topic, introduction, and overview outline. Many of these formats do not mimic any particular script predecessor, even if they preserve footnotes, references, or citations organized according to print conventions. Scrolling texts, pop up windows, rapid refresh in screen displays, all introduce a more rapid temporal rate of re-inscription than print allowed, but the flat space of display to which most screen writing is reduced is, if anything, far less graphically sophisticated than the spatialized physicality of a three-dimensional codex. When we consider where and how writing spaces un-

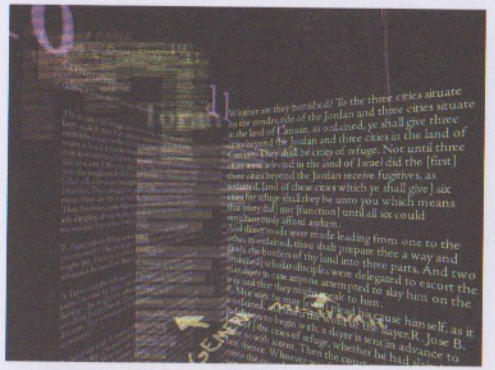
fold in terms of the screen, we see that most use the downward vector of the scroll to extend the writing space and the infinite sidebar as a way of navigating. We gauge our place in a sliding sidebar of text, but do not necessarily have a good sense of its overall size or scope. The accumulating tail of a blog seems even less constrained, as if it were simply unrolling over time, its chunks lopped off to be archived by month or week or day. This is writing without constraint, a mode of production that has no limits in terms of quantity and frequency, and yet is very formulaic in its appearance and rhetorical structures. The graphical codes that express culturally and technically produced protocols are as intimately bound in digital environments as in analogue ones. If anything, our sensitivity to the function of graphical formats has returned from digital to print in recent experience, as acts of innovation and remediation create a dialogue across media. Our retrospective glance illuminates the bibliographical past. Suddenly it seems useful to mine it for ways of approaching the digital future, now that we have a metalanguage to describe the connection between its forms and its operations.

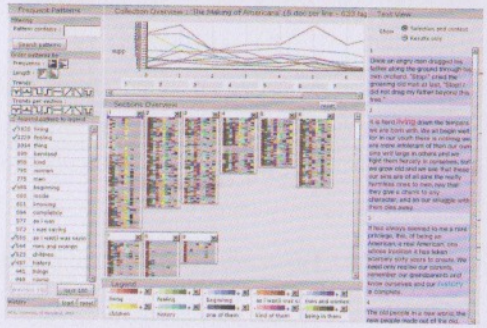


Sandra Gorman and Danny Cannizzaro, design for *Penumbra*, a multi-scaled flexible writing space (courtesy of the artists).

Books of the future, the future of books—how do we secure the place of humanity and human values at the core of a technophilic world? As we have seen, we think we know what a book is—a finite, bounded, set of sequenced pages, defined by its form as an object. We think it is a thing that we hold in our hands, finished and complete, a series of orga-

nized openings with recognizable and familiar physical and graphic features. But in fact, a book is a momentary slice through a complex stream of many networked conversations, versions, and fields of debate and reference across a wide variety of times and places. A book is a temporary intervention in a living field of language, images, and ideas. Each instantiation re-codifies the image of a book as an icon—whether mythic or banal, a treasure or an ordinary object of daily use.

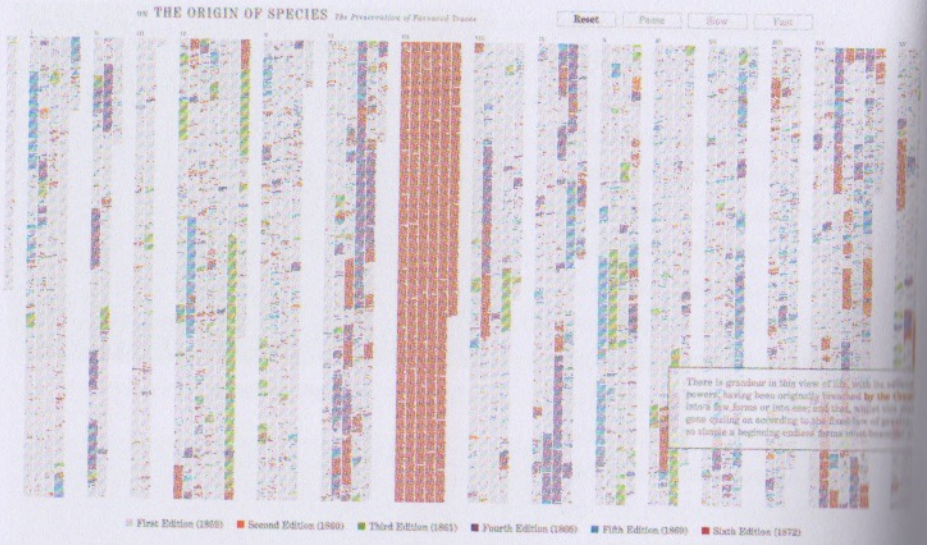




David Small's 3D display of the Talmud (1999).

Stan Ruecker, Tanya Clement, et al., Gertrude Stein's *Making of Americans* mined for repetitive patterns and visualized (July 2008).

The book of the future will not simply imitate the forms of a codex migrated onto new platforms or appearing as apps on an array of devices. It will arise from an analysis of the functions of each element of design for purposes of navigation, orientation, representation, reference, and commentary and then rethink the ways the capacities of networked electronic environments can extend these functionalities and encode them in an innovative approach to design. The future book will be fluid, a conditional configuration based on a call to the vast repositories of knowledge, images, interpretation, and interactive platforms. A book will be an interface, a richly networked portal, organized along lines of inquiry in which primary source materials, secondary interpretations, witnesses and evidence, are all available, incorporated, made accessible for use.



Ben Fry, visualization of editions of Charles Darwin's *Origin of the Species* showing changes to text (2009).

Toward humanistic design

We are in the incunabula period of information design. The scale of complexity challenges our conceptual models. The new condition for scholarly activity is relational and dynamic. To visualize these networked relations, communities of scholarly exchange, argument, comment, linked references, framings, and embedded citations, new conventions that do not rely on book structures are emerging. Informational derivatives of data mining, analytics, visualization, and display are increasingly a part of a reading environment in scholarly, political, and business activity. We have to imagine the design of a situation of sustained activity, a series of events. Just as Parkes makes clear that the graphical formats that became solidified in printed books had their origins in a cultural transformation that began several centuries earlier, in ways

the "structuring of reasoning came to be reflected in the physical appearance of books," so the creation of digital environments for interpretative writing will refer back to earlier precedents and extend their possibilities.[248]

In essence the same critique leveled by post-structuralists against New Criticism is pertinent to the critique of formal structures—whether these are the forms and formats of information visualizations or the screen environments that reify behaviors and tasks in interface designs.[249] The "text" of the graphic expressions I have been attending to in this book is not stable and self-evident. The meaning of these expressions cannot be fixed simply by a detailed reading of their elements. The grid of wireframes is neither a set of neutral boxes for content nor a particular iconographic element. It is a structuring space whose relations create value through position, hierarchy, juxtaposition, and other features in an act of interpretation. These position us within the order of the discourse; they are *structuring regimes*. An interface is a space in which a *subject*, not a *user*, is invoked. Interface is an enunciative system. Texts and speakers are situated within pragmatic circumstances of use, ritual, exchange, and communities of practice. They are affected by it, and so is what they "read" or "receive" through an interface and they/we are produced by it. Taking critical insights from literary, cultural, and gender studies into our current practice will invigorate interface design, as will cross-cultural perspectives. Many designers, such as Dunne and Raby, Garnet Hertz, and Matt Ratto, take notions of critical interface and critical making as ways to intervene in social conditions. In their work, "critical" is closely aligned with "activist" and their designs are meant to prompt action and change. But the performance of critical thought does not necessarily have an instrumental aim. By contrast, merely reading an interface with the same techniques we

used to read *Young Mr. Lincoln*, or following psychoanalytic arguments into a new realm of semiotic analysis, is a rather tedious and predictable path.[250] Though this might have some value in the undergraduate classroom, as the unpacking of ideological subtexts fascinates the young, the real challenge is in conceptualizing the spaces of interfaces that engage humanistic theory.

When we finally have humanist computer languages, interpretative interfaces, and information systems that can tolerate inconsistency among types of knowledge representation, classification, fluid ontologies, and navigation, then the humanist dialogue with digital environments will have at the very least advanced beyond complete submission to the terms set by disciplines whose fundamental beliefs are antithetical to interpretation.

The critical design of interpretative interface will push beyond the goals of "efficient" and "transparent" designs for the organization of behaviors and actions, and mobilize a critical network that exposes, calls to attention, its madeness—and by extension, the constructedness of knowledge, its interpretative dimensions. This will orchestrate, at least a bit, the shift from conceptions of interface as things and entities to that of an event-space of interpretative activity.

We must redress the odd amnesia that has come with the exigencies and tasks defined by digital media and recall our humanist commitment to interpretation. This means embracing ambiguity and uncertainty, contradictions and the lack of fixity or singularity. No file is ever self-identical, and certainly no file is ever the same twice. All expressions in human systems are constitutive, non-representational, and content models. Forms of classification, taxonomy, or information organization embody ideology. Ontologies are ideologies, through and through, as naming, ordering, and para-

materizing are interpretative acts that enact their view of knowledge, reality, and experience and give it form. All acts of migration from one medium to another, one state of instantiation to another, are mutations. The antidote to the familiarity that blinds us is the embrace of parallax, disaggregation of the illusion of singularity through comparatist and relativist approaches, and engagement with fragmentation and partial presentations of knowledge that expose the illusion of seamless wholeness. Veils of illusion are replaced with other illusions. We know this. But acknowledging the refracting effect of individual interpretations across multivalent views creates a restless engagement with the acts of knowing. More attention to acts of producing and less emphasis on product, the creation of an interface that is meant to expose and support the activity of interpretation, rather than to display finished forms, would be a good starting place.