DE/COMPOSING CONSTELLATIONS

REFLECTIONS ON THE DEVELOPMENT OF A COLLABORATIVE MULTIMEDIA ETHNOGRAPHIC RESEARCH TOOL

by

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ABSTRACT

Constellations 2.5 is a collaborative multimedia research tool. It allows a community of researchers to catalog video footage, images, audio footage, text, and World Wide Web references in a shared database, where each piece of data is represented as a "star." All of the users in the database can annotate and analyze this common set of stars by grouping related stars into collections called "constellations," and tagging stars and constellations with key words. Each key word is associated with a numerical rating which describes the relationship between the tag and the piece of data.

This paper presents a detailed description and analysis of Constellations from the point of view of one of its principal designers and programmers. In it, I describe the theories which have influenced its development of Constellations, the history of the design and programming, and the features and workings of the program. I also present a critical analysis of the program and discuss possibilities for its further development. The descriptions, historical accounts, and analyses presented in this paper are meant to contribute to and encourage reflection on the ways in which emerging information technologies are influencing and reforming both the processes by which we generate information and the kinds of information we generate.

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This paper is dedicated to Ricki Goldman-Segall, without whom I would never have programmed Constellations and written this. Working with her has been exciting, challenging and, most of all, rewarding. She has taught me more than I could possibly thank her for in writing.

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INTRODUCTION

Digital media are being used more and more for the storage, creation, processing, and communication of information. This is especially true now that we are able to view and manipulate "high-bandwidth" data such as images, sound, and video. As digital information becomes more common, we are developing new tools with which to handle it. This is a critical juncture at which we can make a practice of integrating both conscious analysis and historical reflection into the process whereby digital media tools become part of, and shape, information. As one of the primary designers and programmers of Constellations 2.5, I present here in an analysis of this collaborative multimedia research tool, developed at the Multimedia Ethnographic Research Lab at the University of British Columbia. This paper is a discussion of the history of the development of the tool and the theoretical culture in which it was built, and a critical evaluation of its design. The purpose of analyzing these key elements is to explore Constellations as a unique representation of culture with an intellectual history — an artifact that exists beyond its simple functionality.

In combination with other kinds of analysis (such as studies of how a tool is used and the products people create by using it), this approach can lead us to a better understanding of how these tools are shaping our collective knowledges and epistemologies. My hope is that this will give us increased capacity and efficiency in shaping the form and meaning of information in our society.

This paper consists of five sections: a literature review, a discussion of the theoretical culture of MERLin, a narrative description of Constellations, an evaluation of the design of Constellations, and a discussion of possibilities for the future development of Constellations.

In the literature review I describe two researchers' analyses of the research tools they use. The first is Charles Briggs. In his book on ethnographic interviewing, *Learning How to Ask*, Briggs discusses the importance of the tape recorder as a tool in his ethnographic interviewing methodology. The second researcher, Trinh T. Minh-Ha, describes herself as an anti-ethnographic filmmaker and writes extensively about the aesthetics of documentary film. Further background in the field of multimedia data analysis tools can be found in Appendix A, where I briefly outline three other video annotation tools: TIMELINES, MacSHAPA, and NU•DIST.

In the second chapter I discuss and analyze two theoretical perspectives which were "in the air" at MERLin during the development of Constellations. The first is represented by Ricki Goldman-Segall's theory of configurational validity, which proposes a new collaborative approach to multimedia data analysis. The second is represented by Judith Butler's theory of gender performance, which proposes that the categories of biological sex, like those of gender, are a product of our culture, and that even our most deeply held biological identities are the result, not the cause, of our actions in society. In my analysis and comparison, I examine the epistemologies of these two theories and the ways in which these different ways of understanding knowledge complement each other.

In chapter three I describe the actual program by presenting fictional narratives from the point of view of two researchers using the program. The first narrative describes how Goldman-Segall might begin to use Constellations to analyze the data she has been collecting from Vancouver Island over the past three years. The second describes how I might use the program to explore and annotate the data she has entered.

In the fourth chapter, I evaluate the design of the program by analyzing the impact of three major decisions our team made in the development of

Constellations. First I discuss the redesign of the notes (comments which can be attached to pieces of data) and the development of Constellations into a database system. I then examine the development of the four-quadrant user-interface design. Finally, I look at the impact of our decision to cease work on the interface design of this version of Constellations when we began development of the next version.

The last chapter is an exploration of two possible future applications of the Constellations model of multimedia data analysis. I begin by describing the specifications which were developed for Constellations 3.0, which will be a native-code Macintosh application. Then I discuss the possibility of developing a Web-based interface to a Constellations database.

The development of Constellations has been a long and complex process. Many people have been involved and influenced its design. Constellations is also an important "object to think with" (Papert) at MERLin; in particular, it has been a provided a bizarre intersection for the discussion of theories of gender and qualitative data analysis. This paper is as much a representation of the complexities of the program's capabilities and design as it is a comprehensive explanation of its functionality and development. It is also only one part of the product of my research, the other being the program itself. Constellations 2.5 is available via the World Wide Web at "http://www.merlin.ubc.ca/" and at the data library of the University of British Columbia.

CHAPTER 1

ETHNOGRAPHY WITHOUT PEOPLE: TOOLS, METHODS, AND DATA

Taking a radically different view of a common phenomenon can be a useful method of analyzing it. The phenomenon in question in this thesis is ethnographic data analysis, and in this first chapter I will review some of the literature about ethnographic research tools. What is different about my approach is that I will do this without looking at the people involved. Instead I will look only at the following three components: the research tools, the research methods, and the data acquired in research. This chapter is divided into two parts. Each part focuses on the writings of a researcher about his or her research tools. In the first part I will review Charles Briggs's writings about his ethnographic work using a tape recorder and how it has formed his research method. In the second part I will discuss Trinh T. Minh-Ha's work and her writings about the relationship between film and ethnographic data.

FEEDBACK: CHARLES BRIGGS AND THE TAPE RECORDER

In his book, *Learning How to Ask*, Charles Briggs explores the interview as communicative event, rather than just as a method used by a researcher to extract data from a subject. Briggs presents two points for consideration in conducting interviews.

The first is that interviews as communicative events exist within a cultural context, and the kind of information they generate has as much to do with the content the interviewer is seeking as with the way in which the interviewee interprets the interview. Briggs makes clear that context is not static, but is constantly renegotiated throughout an interaction (25). Furthermore, this process

of negotiation is affected by the communicative norms of the culture being studied:

> ...the data obtained in interviews are affected by societal differences in the interactional goals of the participants. Even though fieldworkers may define the situation as a focus on the explicit transmission of data, respondents may see the process as entertainment, pedagogy, obtaining cash income, protecting his or her neighbors from outside scrutiny, and so forth. (49)

Failure to recognize and engage subjects in their own communicative modes has a negative impact on one's effectiveness in collecting and interpreting data and amounts to what Briggs terms "communicative hegemony" (121). This hegemony imposes the researcher's communicative norms on the research subject during the interview process. The speech of the interviewee is then framed and interpreted only in terms of the researcher's cultural norms, and the researcher's conclusions are more about his or her own ideas than about the interviewee's.

The approach Briggs suggests for dealing with this issue is observing the community in order to recognize standard communicative events, and then conducting interviews which are enmeshed with these communicative events.

Recognizing that interviews take place within a cultural context leads to Briggs's second point: Interviews are not a process of extracting information from a subject. Rather, "the interviewer rather stands a co-participant in the construction of a discourse" (25). Recognizing that an interview is generative leads to recognizing that interview speech "possesses a *performative* capacity, meaning the words are also means of *creating or transforming* a given state of affairs" (46).

Thus, the researcher cannot stand outside the research process and the cultures within which it occurs; neither can the researched. Both are engaged in an act of construction which invokes strategic performances to build knowledge and reality based on cultural backgrounds, discursive histories, personal considerations, and ideologies of truth. If we are to conduct meaningful research given these considerations, we must begin to take into account the ways in which both our subjects and we ourselves are performers in the research setting.

In an attempt to account for the methodological problems he raises, Briggs presents an interview-based, ethnographic methodology which focuses on the development of communicative competence with the community being studied. This is achieved by close analysis of one's interviews within the community throughout the research process.

This methodology could not have been developed without his primary research tool: the tape recorder. Briggs continually refers to the usefulness of tape recordings. He makes clear the importance of access to original recordings and transcriptions made from those recordings. Without these, he could not have recognized the features of different communicative modes, the negotiation of those modes, the degree to which he was engaging in native communicative modes, or the ways in which he was co-constructing discourse and building new communicative modes in doing his research:

> The sensitive researcher may be able to discern some of the metacommunicative features; such properties are, however, extremely subtle, and most are not consciously accessible in the course of an event. Tape recordings, on the other hand, can be reviewed time after time, transcribed closely, and can be presented to one's consultants for comments. (99)

Briggs's book is a call for methodological sophistication. But he takes at face value the validity of the tape recorder as truth-sayer, without examining the degree to which this tool is at the root of his methodology. Fortunately, Trinh takes up where Briggs leaves off in questioning the validity of a recording device and the way it creates certain kinds of data.

MAKE-UP: TRINH T. MINH-HA AND THE MOVIE CAMERA

In her landmark film, *Surname Viet Given Name Nam*, writer and filmmaker Trinh T. Minh-Ha challenges notions of reality and truth in film. The first part of this film presents interviews with Vietnamese women about their experiences in the Vietnam war. The interviews are conducted in nondescript places and we hear only the women's descriptions of their experiences, spoken in broken English, and not the interview questions. Although the women are Vietnamese, they tell us their stories in English.

The second part of the film reveals to us that these interviews were actually staged. We are now shown the "real" women in naturalistic interviews conducted in the presence of their families, in an everyday environment. These interviews about the process of making this film are conducted in Vietnamese, even though the women live in the United States.

By juxtaposing performances designated as "staged" and "unstaged," Trinh challenges the notion that these two modes of filmmaking, one documentary and one not, can be clearly separated:

> To have the staged and real together is to call attention to the politics of interviews, and to set into relief the manipulations that tend to be taken for granted in documentary. With the more conventional editing of the "real" interviews in the latter part of

> the film, the frequent cutting and montage of the selected statements as well as other elements of manipulation become much more visible, and what one thinks of as being more natural or closer to the conventions of documentary, is actually just as (if not more) fictionalized as in the earlier parts of the movie. (Trinh, *Framer Framed* 165)

Trinh is arguing that people stage their presentations of self, and that an "unscripted" documentary is still directed by the filmmaker and scripted by the actor:

> As spectators, our attitude often proves to be naive. We tend to forget how tactical speech is, no matter how naturally it seems to come out. To assume that testimonies filmed on the site are de jure more truthful than those reconstructed off the site is to forget how films are made. Every representation of truth involves elements of fiction, and the difference between so-called documentary and fiction in their depiction of reality is a question of degrees of fictitiousness. The more one tries to clarify the line dividing the two, the deeper one gets entangled in the artifice of boundaries. (Trinh, *Framer Framed* 145)

The process of representing oneself is not one of exposing a true self. Rather it is a process of enacting and reenacting ideas of self that are entwined in social discourse. In examining Trinh's writings about film, I have found three primary analyses of the kind of content a movie camera generates.

1. Film does not give the viewer unmediated access to reality.

> Reality is more fabulous, more maddening, more strangely manipulative than fiction. To understand this, is to recognize the naivete of a development of cinematic technology that promotes increasing unmediated "access" to reality. (Trinh, *When The Moon Waxes Red* 39-40)

Film does not represent a truer or more accurate representation of a moment than do other forms of data collection. Our common-sense perception is that film is more real because it can make us feel like we are "really there." However, our response is not to an increased level of authenticity, but to an *aesthetic of naturalism*. Naturalism itself is an aesthetic of knowledge, one which values the denial of the process by which the depiction of an event is constructed. However, the more we obscure the processes by which our data are generated the less opportunity we have to explore the environmental and social processes which lead to a subject's performance.

2. There is no unified reality for film to present.

> The real world: so real that the Real becomes one basic referent – pure, fixed, visible, all-too-visible. The result is the elaboration of a whole aesthetic of objectivity and the development of comprehensive technologies of truth capable of promoting what is right and what is wrong in the world, and by extension, what is "honest" and what is "manipulative" in documentary. (Trinh, *When The Moon Waxes Red* 33)

Attempts to present filmed data as evidence of a fixed, positive reality obscure the process by which the video representation of the subject was created. Furthermore, they deny both the myriad realities which converge to construct a

moment and the transformative effects of using a movie camera to record that moment. If we reify our subject's performance on film, we fix that performance as our subject's essence, deny the circumstances and discourses that led to that performance, and deny the possibility of future modification or displacement of that performance.

3. Film can be used to review and reflect on both the subject's and the researcher's performances.

> It must be possible to represent reality as the historical fiction it is. Reality is a paper tiger. The individual does encounter it, as fate. It is not fate, however, but a creation of the labor of generations of human beings, who all the time wanted and still want something entirely different. In more than one respect, reality is simultaneously real and unreal. (Trinh, *When The Moon Waxes Red* 41)

In recognizing film as a considered performance, a reality constructed by both subject and researcher, the researcher can analyze the data as a cultural product — one which simultaneously presents subjects as they appeared, subjects as they wish to appear, and subjects as framed by the researcher. These products can be reviewed in order to generate interpretations of the meanings and effectiveness of a subject's performance at the moment, the researcher's role in invoking these performances, and differences between performances given in different contexts and at different moments.

Unlike Briggs, Trinh does not detail the method by which she produces her data: anti-ethnographic film. Instead she focuses on what kinds of information the tool generates. However, both issues need to be addressed in order to provide a comprehensive analysis of research tools.

CHAPTER 2

THE POST STRUCTURAL LAB: DECONSTRUCTIONISM + COLLABORATIVE CONSTRUCTIONISM =

In a technology focused lab like MERLin, theory plays an intriguing role in relation to the material product of a lab's work, such as Constellations. Though they form the framework of the product, the theories behind the work are not explicitly represented in the product. In this chapter, I will discuss the two most influential theories at play in the lab during the development of Constellations 2.5: Ricki Goldman-Segall's theory of configurational validity as described in "Configurational Validity: A Proposal for Analyzing Ethnographic Multimedia Narratives," and Judith Butler's theory of subject and gender as described in *Gender Trouble*.

At first glance there is no relationship between these two theories other than their poststructural influences. Goldman-Segall writes about how we can assess the validity of multimedia research; Butler deconstructs how we produce and reproduce our gender and sex identities. Upon closer viewing, however, both writers address the important epistemological question of how we represent and create knowledge about ourselves and others.

In this section I will explore what both Goldman-Segall and Butler suggest as the kind of knowledge we should be creating. To represent the loosely structured dialog I have constructed with both of these author's writings, I have divided this chapter into three sections: first I present my interpretation of Goldman-Segall's theory, then I present my interpretation of Butler's theory, and finally I discuss the interconnections I have built between the two theories.

This chapter intentionally does not present a tight, cohesive theoretical framework upon which Constellations was built. That would not be an accurate

presentation of how Constellations was developed. Much like the kind of analysis the program encourages, the theoretical framework behind Constellations is a lively dialog between multiple points of viewing (Goldman-Segall, *Points of Viewing*). Neither a compromise nor a battleground, the theoretical framework supporting Constellations is a richly textured, multiple-layered tapestry of ideas.

RICKI GOLDMAN-SEGALL: LAYERING THEORY

In her article, "Configurational Validity," Goldman-Segall proposes that "stories of multiple 'authors' can be layered in clusters, or 'constellations,' in such a way that larger more robust theories emerge" (163). While this describes the mechanism by which configurational validity operates, the heart of Goldman-Segall's argument deals with what makes a theory robust:

> Configurational validity contributes to the expanding belief that validity in research is enriched by multiple points of view. We recognize the internal 'strength' (*validus* in Latin) of a reporting, not only by its rhetorical ability to persuade, its compelling author/ity, and its exclusive use of canon and genre, but by its ability to bend, to be resilient, and to be reconfigured in new groupings. (165)

In configurational validity, the less authority — the less *lasting truth* it embodies — the more robust, or lasting, an interpretation is. This destabilizes the very notion of data, results, and presentation by positing that data and results are not supposed to be stable and untouchable. Rather, they change and are rearranged through an unclosed research process. This destabilizes the traditional notion of results to the point where the theory itself is paradoxical to the notion of the products of research which Dr. Goldman-Segall is trying to redefine.

The contradictions emerge in relation to our understanding that valid (strong) knowledge is timeless; it must exist outside of our continual production and reproduction of knowledge. Goldman-Segall describes the process of building a valid multimedia research document as entailing "sifting through the layers to find essential themes and patterns, which I refer to as 'configurations'..." (165). I believe that in this context Goldman-Segall's use of the term "essential" themes speaks to a notion of themes which transcend a particular point of view, rather than a sense of timeless reality. However, the implied meaning of the word "essential" is in contradiction to the notion that interpretations should be able to "reconfigured in new groupings."

Later in the article, Goldman-Segall describes how Constellations, a tool whose development was directly based upon the principle of configurational validity, encourages theoretical flexibility and reconfiguration in a collaborative environment:

> The layering of data blurs the distinctions between original researcher and users. Each user accesses and chunks the data differently. An interactive document is created when interpretations continue to be shared and negotiated, enabling researchers to interact with other researchers in a way that all users become part of the interpretation process. (178)

She describes this layering as an element of Constellations that enables multimedia stories to become more trustworthy. The notion of trustworthy presentation, even understood in the context of presenting a viewer/user with a large range of interpretations and points of view, has a tense relationship with the way in which Constellations encourages a user to distrust existing interpretations; to appropriate and reconfigure the research in order to develop his or her own interpretation.

The two conflicts I describe above are significant in that they exemplify the tension within this theory between the need to measure the validity or strength of a multimedia ethnographic document, even if only in one given instance, and the instability or flexibility (which is what actually determines validity) of strong results. How do we meaningfully gauge the flexibility of the results of our research as a product if we are continually changing and reconfiguring them?

JUDITH BUTLER: DE-SEXING THEORY

Butler begins *Gender Trouble* by asking, "...can feminist politics do without a 'subject' in the category of woman?" (142). In the course of her book, Butler challenges the notion of the precultural, sexed body, the neat bifurcation of sex from gender, and the idea that identity-laden subjects can be liberated from oppressive social conditions.

For Butler, biological sex is not a prediscursive reality which can be researched and understood as culture free. Rather, "it is an artificial unity imposed on an otherwise discontinuous set of attributes" (112). The research of biological sex is a process of producing a cultured understanding of the body, which obscures the process by which it is created by describing biological knowledge as empirical evidence. Thus the categories of male and female and their respective attributes become part of our common-sense understanding of reality.

A cultured notion of sex upsets the separation of sex from gender, as this separation is based on the distinction between the cultural and the biological. Butler's challenge to the sex/gender distinction moves the notion of identity from one of cause to one of effect. In other words, the body in which one is born does not determine identity. Rather, identity is an effect of one's actions:

> This narrative of gender acquisition requires a certain temporal ordering of events which assumes the narrator

> is in some position to "know" both what is before and after the law. And yet the narration takes place within a language which, strictly speaking, is after the law, the consequence of the law, and so proceeds from a belated retrospective point of view. If this language is structured by the law, and the law is exemplified, indeed, enacted in language, then the description of that "before" will always be in service of the "after." (74)

> ...there is no distinction between sex and gender; the category of "sex" is itself a *gendered* category, fully politically invested, naturalized but not natural. (112)

Deconstructing the notion of a precultural, universal woman who is the subject of feminism radically transforms notions about the project of feminism.

Instead of transforming the internal structures of our society, feminist politics which attempt to liberate "woman" from a patriarchal society affirm and reproduce the cultural structures which binarize people and place them in opposition to each other. The insistence on a unified subject does not liberate people to express a mysterious identity, free from the contamination of power. Rather, it continues to recreate the ideological structures of sex and gender and redeploy power to regulate them.

The alternative that Butler posits is to recognize that "there is no gender identity behind the expressions of gender; that identity is performatively constituted by the very expressions that are said to be its results" (25); and that

there are no "true or false, real or distorted acts of gender, and the postulation of a true gender identity [is] a regulatory fiction" (141).

In challenging this fiction, Butler suggests that new identities can be created through contradictory performances which displace the uncontested "natural" performances:

> The task is not whether to repeat, but how to repeat or, indeed, to repeat and, through a radical proliferation of gender, to displace the very gender norms that enable the repetition itself. (148)

For Butler, knowledge is constantly being (re)created through performances which repeat, reaffirm, or contest previous knowledges. In this stream of repetitions, how do we reconcile a denaturalized identity with the natural perception of our performances? In the process of moving knowledge of the self (identity) from a source inside to an effect which creates the self, we are left with neither an account of the continuity of our perception of ourselves, nor an understanding of how our perceptions assemble a coherent "natural" body.

LAWRENCE HALFF: TIME FOR THEORY

Both Goldman-Segall and Butler argue that desirable knowledge is knowledge that embodies instability. For Goldman-Segall, validity is determined by how flexible, reconfigureable, or even re-interpretable a conclusion or a theory is. For Butler, contradictory performances which displace assumed, repetitive performances of gender create a critical awareness of our assumed reality.

Because both of these theories employ some of the traditional philosophical and scientific notions which they critique, both contain conflicts which perhaps cannot be resolved within the structure of the theories themselves. However, I believe that these theories, when placed next to each other in the spirit of

flexibility and destabilization, speak to each other's contradictions. To see how this happens, I will first analyze how each theory implicitly builds a historical notion of knowledge, or an explanation of the relationship between knowledge and time. I will then look at how these notions of time relate to the internal contradictions I have discussed in the section on each theory, and how these differing notions of time can answer these contradictions.

Configurational validity has a strong historical sense. While information and interpretations are added and reconfigured to make new knowledge, configurational validity suggests that we retain all of the information and all previous interpretations. This retention of information is one component of the internal conflict I discuss in my analysis of configurational validity. While the strength of a theory depends on its flexibility, Configurational validity suggests that we look for transcendent, essential themes. Valuing a collection of data and interpretations as historical truth is what can lead a researcher to look for essential themes. So while we are reconfiguring interpretations and information to make new knowledge, we are working with a stable (in the sense of preexisting) set of pieces with which we build these configurations.

Judith Butler's theory presents a different notion of time. In her theory of repetitive performances, as new knowledge is created it replaces or displaces older knowledge. Knowledge exists in a disposable stream, rather than in a collection of information and interpretations.

The tension in Butler's theory is due to our perception of a historically contiguous reality, which leads to the perception of a natural body. She does not account for the fact that we do not perceive our identities and bodies as being made and remade with every action or "performance."

If one views these different notions of time as complementary, these two theories can alleviate each other's conflicts and contradictions. Butler's notion of a slipstream reality, in which past configurations are not held onto, can relieve the tension of looking for transcendent interpretations in a constantly shifting configuration of information. Goldman-Segall's notion that previous knowledges and interpretations can persist as we add and arrange new understandings can help us understand how we build a consistent perceptual reality, rather than a series of disjointed repetitions of ourselves.

In using both theories to interpret information, we can use parts of one where the other fails to help us build a complex or comprehensive understanding of the information at hand. The ability to support diverse theoretical perspectives is an important feature in a tool which is meant to assist different people in analyzing data from different sources in different formats.

In conclusion, the theoretical framework upon which Constellations is built is not a structure upon which the features of the program are hung. Rather, it is instead an open dialog between people with unique theoretical perspectives. This allows for flexibility in how researchers employ this tool, use it to develop their analyses and theories, and further influence its development.

CHAPTER 3

FOCUSING ON CONSTELLATIONS

What is a collaborative multimedia ethnographic research tool? What does it do and how does it work? In Constellations, we have created such a tool in the form of a database application which allows a researcher to catalog, describe, and organize data of any type, as long as it is in a file available on her computer. In this chapter I will present two user narratives which describe various uses and features of Constellations. In the first, I follow a researcher as she creates and builds a database, eventually describing her data and organizing pieces into related groups which form the interpretive structures of her analysis. In the second, I follow one of the researcher's colleagues as he explores, comments on, and builds his own interpretations of the data entered by the original researcher. These two narratives will be periodically complemented by other "real-life" narratives, explaining the design and creation of different structures and features of the program.

Over a period of two and a half years, Dr. Goldman-Segall made periodic visits to the Bayside Middle School to observe, talk to, and hang out with the students in two grade seven and one grade eight class involved in using computers to conduct socioscientific inquiry. In the 1993-1994 and 1994-1995 school years, the students were studying Clayoquot Sound, an old-growth rain forest on the west coast of Vancouver Island. Clayoquot Sound provides a unique opportunity to explore socioscientific issues. It is not only a rich and now unusual environment, but also the subject of an intense controversy about environmental conservation and logging practices. While this controversy focuses primarily on the effects of clear-cut logging, it involves many other not-so-obvious but deeply related issues such as job security, fishing, water quality, and tourism.

In working with the students while they conducted their inquiry, Goldman-Segall collected enormous amounts of video of them in class, in the field, and in interviews which she conducted about their research. She also has still photographs and video footage of Clayoquot Sound, text reports the students produced as part of their class work, and newspaper articles with summaries. As I write this paper, Goldman-Segall is working with Constellations to analyze this data and build case studies on the students.

Taking inspiration from Trinh's *Surname Viet Given Name Nam*, I will, in a sense, present a script in which Goldman-Segall starts using Constellations to analyze her data. In scripting her documentary, Trinh presented a personal and collective understanding of the cross-cultural experience of being a Vietnamese-American woman, which both conveys a sense of truth and honesty from her position and makes clear that she has constructed this particular understanding and left the collective experience open to reinterpretation. Trinh's documentary is not "real" in our common-sense understanding of that word; neither are the narratives I will present. The design and creation of Constellations was both a personal experience for me and a collective experience for everyone involved. I will use the following constructed narratives to reflect my own understanding of what Constellations is and how it may be used. Through this interpretation, I will provide a sense of the collective process of designing Constellations.

In the first narrative I will write from the point of view of Goldman-Segall as she analyzes the data she has been gathering with the young people at the Bayside Middle School in the course of building her case studies. In the second I will script my own story of using Constellations to analyze and reconfigure her data and analyses.

By looking at this chapter from the points of view presented in the different stories, one can gain an understanding of the concurrent processes that led to

Constellations being developed the way it was and having become the program it is.

BUILDING THE UNIVERSE: A RESEARCHER CREATES A CONSTELLATIONS DATABASE (TOLD IN THE VOICE OF RICKI GOLDMAN-SEGALL)

I can't believe this point has finally arrived. I've been collecting data for three years at the Bayside Middle School and Clayoquot Sound. I have gone through hours and hours of video and selected key pieces. I have also sorted through still photographs and the reports that the students have written. Selecting the data I wanted to analyze was a slow and painstaking process. After cutting out over 90 per cent of my raw data, I had to convert the video and photos into digital format, consolidate and organize all of the information onto one hard drive, and then press it onto a CD ROM.

How do I start using the program?

Now, I am finally ready to sit down with Constellations,[1] sort through what is at this point a disorganized pile of information, and spin what I hope will be an intricate and flexible web of interpretations. I double-click on the Constellations icon in the Finder, and begin my journey into data analysis. Once Constellations is loaded, I create a new database and log in (Figure 1) as a new user. After logging in I am presented with the main Constellations window (Figure 2).

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[1]**The Origin of Constellations:** Constellations 2.5 is based on a content-specific multimedia ethnographic research environment developed by Dr. Goldman-Segall as part of her doctoral work at MIT (Goldman-Segall, *Learning Constellations*).

As she describes it, Learning Constellations is, "a set of six video discs and a specifically designed HyperCard application providing access to video observations, transcripts of the video, text, and video annotations, and textual analysis.... In addition, Learning Constellations allows users other than myself (e.g., teachers and researchers) to examine my original documentation and add new levels of interpretation by including their own written observations of the existing descriptions."

The primary objective of redeveloping Learning Constellations into Constellations was to apply the theoretical principles of Learning Constellations to the creation of a generic research tool, which any researcher could use to analyze and present multimedia data.

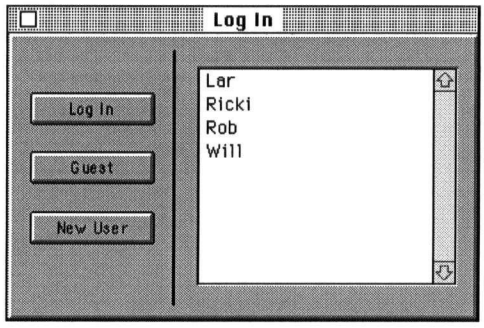

Figure 1: Log In window

How do I enter a piece of data?

Beginning at square one, I select New Star[2] from the Entry menu. Information for a new star appears in the top left quadrant[3] of the screen. I click on the file button and Constellations prompts me to select a data file. I am using Constellations to sort through my data and build case studies about the students at Bayside, so I choose a piece of video where one of these students, Ross (Figure 3), talks about his conception of science. The QuickTime movie I've selected appears in the upper right-hand quadrant of the screen, right next to the part of the screen that contains the database information about the star I am creating.

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[2] **Stars and Constellations:** The operating metaphor in Constellations is that separate pieces of data[4] can be represented as "stars" and meaningful groups of data as "constellations." Both stars[8] and constellations[11] are types of database entries which can be viewed, layered,[5] and commented upon.

[3] **Quadrants:** In the early stages of the development of Constellations, the design team, which at that time was composed of Ricki Goldman-Segall, Monika Marcovici, and myself, was struggling with building a basic user-interface structure which would make available the bulk of Constellations functionality in HyperCard's one window. Scott Flynn, a graduate student at MAGIC, started to work with our team, developing user-interface prototypes in NeXT Step.

Using NeXT interface standards he developed a quadrant-based system which located the different data display and manipulation functions in a progressive order: access to the general terms in the database (bottom right), a list of specific entries in the database (bottom left), information about a specific entry in the database (top left), and the data file associated with a specific entry in the database (top right). We translated this general design and, as you can see in Figure 2, it has retained some of the NeXT look and feel in the browser-like division of screen space in the bottom half of the screen.

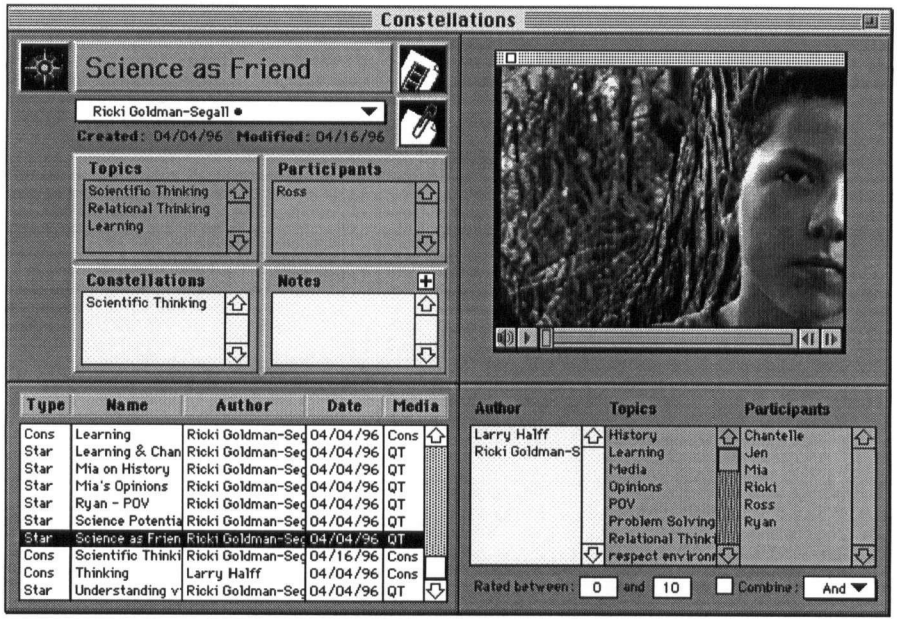

Figure 2: Constellations window

After looking at the whole piece of video, I decide that the first and last parts are distinct and that I want to separate this clip into two stars[4] (Figure 4). I go back to the beginning of the movie and play it until it is at the end of the first section of video. I press the Data File icon, and the Data File Information palette appears. I then click on the Set Out Point button to define this section of video for this star.

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[4] **Granularity:** First defined by Lippman (in his five conditions for an interactive relational system [interruptibility, granularity, limited look-ahead, graceful degradation, and the illusion of infinitude], as the ability to define the smallest meaningful grain or chunk of information. Goldman-Segall has applied this to the problem of working with an unbounded stream of video in a hypermedia environment (Goldman-Segall, "Interpreting Video Data"). If one is to analyze a stream of video, it must first be broken up into pieces which present meaningful information in the context of the question being asked or the theories being tested. The preliminary stages of video analysis, where the researcher is deciding what pieces of video she needs to access, might call for a coarse sieve. As she continues working with the data, she might want to segment entries into smaller pieces in order to focus her analysis on fine details. Constellations allows the researcher to break down pieces of video in order to yield different and finer levels of granularity in the final analysis process.

Figure 3: Ross

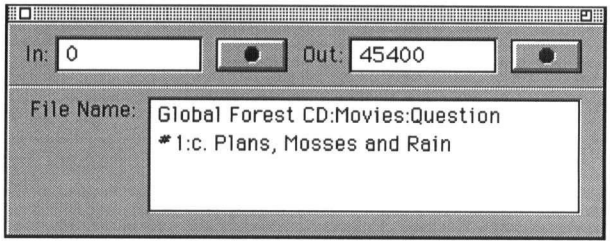

Figure 4: Assigning in and out points

How do I tag a piece of data?

I look over the piece of video I have defined and choose a name for this star: "Science as Friend." I save the entry in preparation for layering[5] it with topics and participants. First I add three items to the list of available topics: "relational thinking," "scientific thinking," and "learning." I also add some participants: Ross and myself, Ricki. These descriptors are listed in the database access quadrant. To add them to this star, I drag each one to the appropriate field in the entry information quadrant[6] (Figure 5). After I attach a topic or participant to the star, a

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[5] **Layering:** One of the most important advances made during the development of Constellations 2.5 was the addition of the significance measure, which allows researchers to layer, or add "layers or thickness to raw data" (Goldman-Segall, "Interpreting Video Data" 270). This enables us as researchers in a community to see which data are most significant, given our research interest or point of view.

When a researcher attaches a descriptor (a topic or a participant) to a particular database entry (a star, constellation, or note) she is given the chance to assign a numerical rating (Figure 6) to that particular topic in relationship to the entry. So, if I had a video clip featuring plants which happen to have a few insects crawling around on them, I would most likely assign a topic called "plants" a high rating and one called "bugs" a low rating (unless I was an entomologist).

In the process of reviewing her data, a researcher could search the database to find all of the clips where a particular topic or participant was important. Researchers looking at the same pieces of data could compare the way they layer them and explore each other's different points of view. In this way layering complements the building of constellations by facilitating the researcher's exploration of the ways she and her colleagues intentionally or unintentionally group data.

[6] **Entry information quadrant:** The entry information quadrant is located in the top left corner of the window (Figure 6). When an entry is opened, all of the database information about that star is displayed there. This quadrant also provides access to entering and changing information about a database entry. In the top left corner of the quadrant is an icon showing the type of entry: a star, a constellation or a note. Next to that is a field for the entry's title. Next to the title field is an icon/button which allows the researcher to attach a data file, or shows what type of file is attached. Below the Data File icon is a button which opens the Author's Note windoid.[12] Below

rating scale appears (Figure 6), with a draggable rating indicator. I use the scale's controller to assign a significance rating for each descriptor.

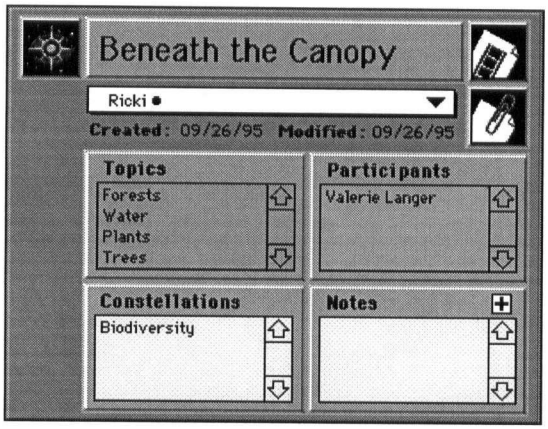

Figure 5: Star entry

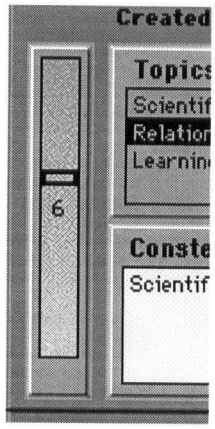

Figure 6: Rating scale

How do I attach a transcript?

I'm almost done with this entry for now, but I remember that I have transcripts of all of my video selections. I open my transcript file in a word processor, find the section for this video clip, and copy it onto the clipboard. I go back to Constellations and press the Author's Note button. This brings up the Author's Note windoid,[10] where I paste in the text.

How do I duplicate this star?

I close the Author's Note windoid and save the star by selecting Save Entry from the Entry menu. I'm ready to make the next star from this QuickTime

movie, so I choose Duplicate Entry[7] from the Entry menu. This creates a copy of the entry I was working with, so I don't have to go through the process of making a new star and reattaching the file. Constellations automatically sets the in point at the end of the previous star and the out point at the end of the movie, which happens to be what I want for this star. I name the star "Ross on Being There" and repeat the descriptor layering process, assigning topics and participants appropriate for this section of the QuickTime movie.

I continue making stars[8] (Figure 5) until I have viewed, segmented, and layered just about all of the data available. I have been reflecting on the topics and participants as I built the database; I must now begin to focus my interest. I examine the descriptors, asking myself, "Which of these topics and participants could be related and how?" and "What kind of relationships among these topics and participants am I looking for in developing my case study?"

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the title field is the Author menu,[16] which shows the author of the entry when the entry is opened. Below the author menu are fields showing the date on which the entry was created, and the date on which the entry was last changed.

In the bottom section of the entry information quadrant are four list fields. The top two show the topics and participants which have been attached by the author currently selected from the author menu.

The bottom two fields show the links made to this entry. The right field always shows the notes made about this entry. If the entry is a star, the left field shows the constellations of which that star is a part. If it is a note, this field shows the entry the note is about. If it is a constellation, the field title becomes a menu from which one can select whether the field will show the items within this constellation or the other constellations which contain this one.

[7] **Duplicating entries:** This feature is a direct complement to defining in and out points. When a researcher is segmenting a large video file, instead of having to re-select the video file every time she makes a new star, she can simply duplicate the entry and define different in and out points.

Constellations makes a guess at the researcher's new segment by placing the in point at the original star's out point and the out point at the end of the video clip. This facilitates the process of sequentially dividing a long movie into a series of segments.

[8] **Stars:** The star is the basic entry type in Constellations. It represents a single piece of data. It includes a title, an author (who created it), a creation date, the date on which it was last modified, and a piece of data. It can be layered by different authors, become part of one or more constellations, and have notes attached to it. The author who created it can also enter text about this star, such as a transcript of the data or some background information.

How do I find information in the database?

I start my explorations by looking at how two of the students, Ross and Mia, talk about "scientific thinking." To perform a database search for this information, I first select Ross from the participant list in the database access quadrant[9] (Figure 7), and select Find from the Entry menu. This fills the entry list quadrant[10] (Figure 8) with a list of stars in which Ross appears. I then select Mia from the participant list. I want to add all of the stars about Mia to the list of stars I already have about Ross, so I check the Combine check box and select OR from the pop-up menu. I again choose Find from the Entry menu, and the entry list

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[9] **Database Access quadrant:** The database access quadrant provides information which pertains to the database as a whole and serves as a tool for working with that information. It has three main fields: one that lists all of the authors who are using the database, one that lists all of the topics in the database, and one that lists all of the participant descriptors in the database.

Aside from showing the index keys for the database, it performs two important functions: it allows the user to search the database and allows an author to assign descriptors[5] to an entry.

Users can perform several types of searches. If they select only an author's name, and then select Find from the Entry menu, the database will list all of the entries created by that author. If they select only a topic or participant, they will be given a list of entries where any author has assigned that descriptor. If they select an author and a descriptor, they will be presented with a list of entries to which the selected author has assigned the selected descriptor.

These searches can be modified in two ways: descriptor ratings can be filtered or they can be combined with the entry list already present. To filter descriptor ratings, the user enters the range of ratings in which the descriptor must fall in the Rated Between fields. To combine the search results with the current entry list, the user checks the Combine check box and chooses a combine logic from the menu.

An "AND" search will only display the entries which are in both the current entry list and the results of the new search. An "OR" search will combine and display all of the entries from the current list and the new search. "NOT" will display all of the entries which are found in either the current entry list or the new search results, but not both.

[10] **Entry List quadrant:** The entry list quadrant displays a list of entries that is generated either by selecting List All from the Entry menu, or from a search defined by the database access quadrant. The quadrant provides a table where each column shows the kind of entry (star, constellation, or note), the title of the entry, the entry's author, the date it was last modified, and the kind of file attached to the entry. The list can be sorted by each of these keys by clicking on the column labels.

By double-clicking on an entry, the user can open the entry, which will displayed in the top half of the screen. The user can also use this list to connect entries by dragging one of the entries from the list into the appropriate connection list in the entry information quadrant. For example, if I were building a constellation, I would drag the desired entries from the entry list into the contents field. Likewise, if I were viewing a star, and there was a constellation in the entry list in which I wanted to place the current star, I could drag that constellation into the star's Constellations field.

quadrant is filled with a list of all the stars in which both Ross and Mia are participants.

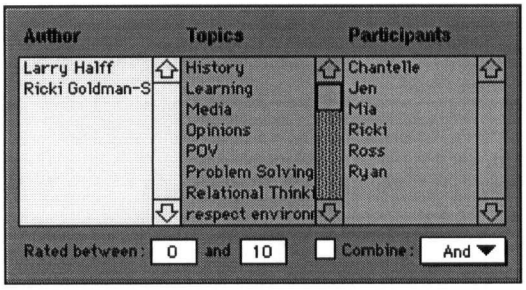

Figure 7: Database access quadrant

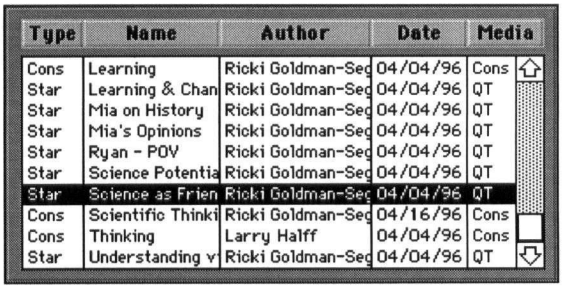

Figure 8: Entry List quadrant

Next I want to narrow my initial search result so that it only contains the stars where I've attached the topic "scientific thinking." I select "scientific thinking" from the topic list in the database access quadrant, leave the Combine check box checked, but choose AND from the pop-up menu. A shorter list of stars appears in the entry list quadrant, showing me the four stars in the database where Ross and Mia are participants and "scientific thinking" is a topic.

How do I create a constellation?

These four stars represent an interesting combination of different aspects of scientific thinking and thinking about science: two of them feature Ross, who talks about science as a friend and learning by being there, and two feature Mia (Figure 9), who talks about how we form opinions with others and use our scientific knowledge to change things. To create a new constellation[11] (Figure 10), I choose New Constellation from the Entry menu. This clears the entry information quadrant and presents me with an empty constellation. I title it "Scientific Thinking: Mia and Ross." I then drag each of the four stars from the entry list quadrant into the contents list field of the constellation entry.

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[11] **Constellations:** A Constellation is the second type of database entry in Constellations. It has all of the same basic features as a star. However, there are no data attached to a Constellation. Instead its "data" are a list of the other stars and constellations which it contains.

Figure 9: Mia

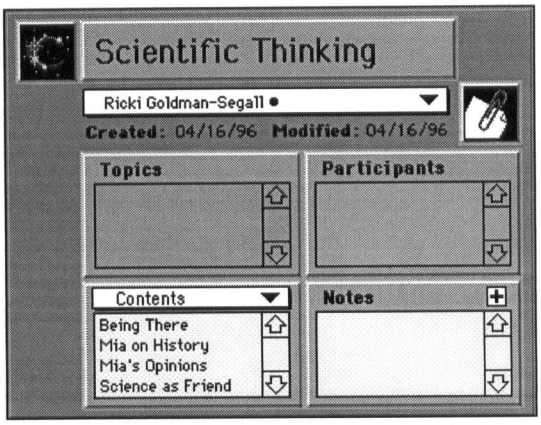

Figure 10: Constellation entry

As I drag each of these stars into the contents list, I have the option to rate it, just as I would a topic or participant. This gives me a unique opportunity to explore different ways of using the rating scale. I decide to rate each star, based not on its relevance to the constellations as whole, but rather on the degree to which the subject discusses scientific thinking as relational. I give Ross talking about science as a friend a rating of 10, Ross on learning by being there a 6, Mia on how we form opinions a 5, and Mia on how we use historical knowledge an 8. I know I have to communicate to other users what my ratings mean, so I click the Author's Note[12] button in the entry information quadrant to open a text windoid where I explain my rating system.

Next, I want to create a display for this constellation, so that I and other users can simultaneously view and compare the four video clips. I choose Display Data from the Entry menu and Constellations opens up the Constellation Designer[13]

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[12] **Authors Note windoid:** The Author's Note windoid is a floating window where the author of a particular entry can enter text that is related to this entry. It is intended to be a place where the author can give some background about the data presented in this entry and/or make available transcripts of the data. It provides a simple way for an author to provide some additional text that can be viewed along with the data, without having to create a whole separate note.

[13] **Constellation Designer:** The Constellation Designer is an additional program that runs alongside Constellations and allows authors to create presentations of their constellations on a two-dimensional plane. The Constellation Designer window is divided into two parts. The top section shows the name and the author of the constellation being displayed and the bottom section is the constellation map, where the entries which are part of this constellation appear as icons.

(Figures 11 and 12). I am prompted to place each star on the designer's two-dimensional field. I place the pieces of video in a square, with Ross talking about science as a friend first, Mia talking about how we use what we learn next to it, Ross on learning by being there below the first one, and Mia on forming opinions below the second one.

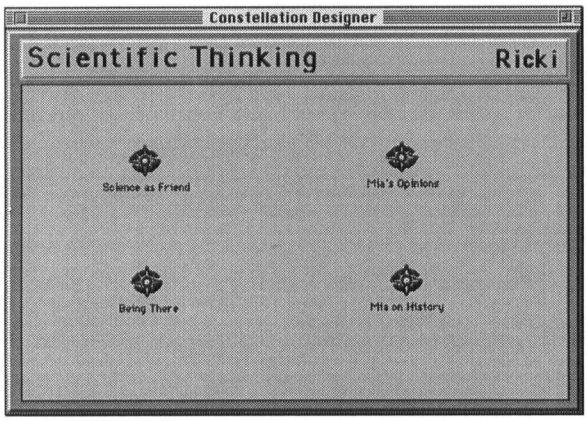

Figure 11: Constellations Designer with stars closed

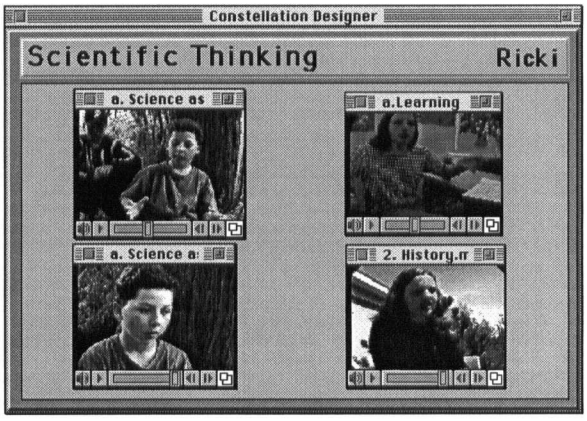

Figure 12: Constellation Designer with stars open

I can now open each of the entries up and place the movie windows where I want them and analyze the relationship between these pieces in important ways: I can compare Ross and Mia's body language, gestures, and style of speech, and I can look at what kinds of words they use and whether they employ similar concepts in talking about science.

Having begun the exciting but time-consuming task of data analysis, I continue to build and reflect upon the database, adding more pieces of

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When a constellation is opened by its author in the Constellation Designer, if it is new or if new stars have been added since the constellation was last opened with the designer, the author is prompted to place each item contained within the constellation on the constellation map. Items on the map can be moved after they have been placed by simply dragging them, like files in the Finder.

Anyone can look at the stars and constellations placed on the constellation map. Stars can be viewed by double-clicking on the star icon on the map. If Constellations supports the display of the attached file within the program, a window will be opened up with the data over the star icon.

If a user double-clicks on a constellation, that constellation will be opened within the Constellation Designer. The user can also open an entry on the constellation map in the actual Constellations program by option-double-clicking on the entry's icon.

information and building more constellations. Eventually, after I have created a richly layered database, I invite my assistant, Larry Halff, to examine and comment upon my research.

NAVIGATING THE UNIVERSE: A COLLEAGUE EXPLORES THE CONSTELLATIONS DATABASE (TOLD IN THE VOICE OF LARRY HALFF)

Ricki has been using Constellations for a couple of weeks now to build a database of her research from the past few years. She has asked me to explore and build my own layerings of the data she has entered. I launch Constellations and open the database[14] (Figures 13 and 14) she has created. I am presented with the Log In window and enter myself as a new user.

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[14] **Constellations database:** The structure of the Constellations database is the part of the program which has undergone the most changes throughout the development process. When Constellations was first being reprogrammed, the database was built free-form, using HyperCard's card structure. When it became apparent that this would not be fast enough to handle real data analysis, Monika Marcovici located a relational database external called FileFlex.

She then developed a database structure and reprogrammed the stack, so that one card served as the interface to the database. Information was retrieved from the database and used to fill in the various fields on the Constellations card. However, because of the structure of this database, there were severe limitations which prevented the program from becoming truly collaborative. Different authors could not assign their own descriptors and ratings to the same entry and links existed as a relationship between two of the three types of entries.

In spring of 1995, when we decided to continue the development of the HyperCard version of Constellations (as the development of the native version was moving more slowly than expected) I redeveloped the database structure to allow for collaborative layering and hierarchically structured connections.

The main table in the database is the Entry table. This contains the database information about every entry: its title, which author created it, what file is attached, etc. Every entry is also given a unique identification number, which the descriptor tables and the links table use to refer to that entry.

The links table has a field for a parent ID number and a child ID number. This can represent the two kinds of links between entries in Constellations. Entries can be contained in a constellation, with notes attached to another entry. The generic child-parent relationship allows for constellations to be placed within other constellations and notes to be made about other notes.

There are two descriptor tables: one for topics and one for participants. The tables are identical; each has a field for the ID number of the entry to which this descriptor is attached and a field identifying the author who attached this rating. This records which author assigned a particular descriptor and rating to an entry, which allows more than one person to assign descriptors and ratings to a single entry.

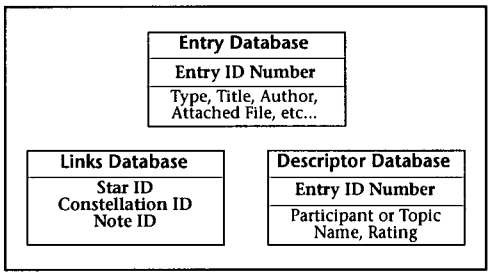

Figure 13: First database structure

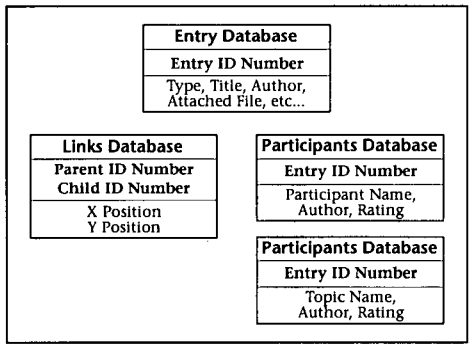

Figure 14: Final database structure

How do I use the search function to sort through layers?

I examine the list of topics and participants Ricki has created. Browsing through the list of participants, I see Ross's name, and remember that he had some very interesting discussions with Ricki about science, so I decide to search for all the stars in which Ross makes a significant appearance. First, I select his name from the participant list. Then I use the rating filter[15] by putting 5 in the first Rated Between field, so that the rating filter reads "Rated between 5 and 10." I then select Find from the Entry menu.

This fills the entry list quadrant with a list of entries in which Ricki has rated Ross as a participant with a value of at least 5. I look through the list and open a star called "Science as Friend." The entry information quadrant is filled in and the QuickTime video attached to this entry is opened in the data viewing quadrant. I watch the section of video that Ricki has selected from this QuickTime movie and look at the topics she has assigned.

---

[15] **Rating Filter:** By using the rating filter, a user can search for only the entries where a particular descriptor is rated within a specified range. This facilitates the function of layering in viewing the database. One can look for certain layers of descriptors within the database; for example, the layer of entries where a particular topic was very important, or the layer of entries where a particular topic was present but very unimportant. This becomes even more powerful in searching for a particular author's layering by choosing an author as one of the search terms. Alternately, one can combine searches to view very specific "layers" of the database.

How do I attach my own descriptors?

I see that she has assigned the topics "relational thinking," "scientific thinking," and "learning." I click on each of these topics and see how she rated them. I also open the Author's Note windoid to see if she has made any special comments about her rating system. I see that she has placed only the transcript there, so I assume that she has assigned her ratings based on the significance of this descriptor in relation to the star. I view the video again, and select my name from the Author's menu[16] (Figure 15) in the entry information quadrant.

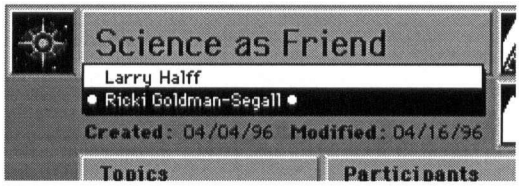

Figure 15: Author menu

The topic and participant fields are now blank, showing that I have not assigned any descriptors to this star. I decide that I will use the same three topics Ricki used, but give them my own ratings. I drag each topic[17] to the topic field in

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[16] **Author menu:** When the database became capable of supporting multiple authors assigning descriptors and ratings to the same entry, I needed to create a simple tool which allowed the user to view other authors' layerings. My solution was to turn the author field into a pop-up menu. When you open an entry, the menu defaults to the author who created that entry, and the topic and participant fields show the layerings of that author.

When you select another author from the pop-up menu, the layerings of the selected author appear in the topic and participant fields. To make sure you can always tell who created the entry, when you are selecting different authors from the menu there is always a "•" to the right of the entry creator's name in the pop-up menu.

[17] **Assigning descriptors:** In the first redevelopment of Constellations, an author could assign topics and participants to an entry by selecting them from a floating window which contained the complete list of topics or participants. As we moved towards putting everything into one window, there was less room for peripheral information, and the floating windows crowded the screen and would often be opened and closed and reopened again as the user did different tasks with the program. This duplicated the lists already found in the database access quadrant, and added complexity to the program, as the duplicate lists had to be synchronized with each other.

When a drag external became available, and "drag-and-drop" became a more familiar element of the Macintosh user interface, I removed the palettes and implemented a routine whereby the user can add descriptors to an entry by dragging them from the lists in the database access quadrant to the appropriate field in the entry.

the entry information quadrant. As I attach each topic to the entry, I choose a rating from the rating scale. I also add one new topic to this star: "respect for environment." It's not already in the database, so I first create the new topic by selecting New Topic from the Descriptors menu and filling in the dialog box. I then drag it to the star's topic list, and assign it a rating.

How do I compare ratings?

I want to see how my topic ratings compare to Ricki's, so I select Topic Chart[18] (Figure 16) from the Entry menu. This presents me with a spreadsheet-type chart, with the authors (Ricki and myself) listed in the columns and the topics listed in the rows. I see that while we both rated "relational thinking" and "scientific thinking" fairly high (between 8 and 10), I have rated "learning" lower than she has (4 to her 6), but have given "respect for environment" a 7.

Topics of Science as Friend

	Larry Halff	Ricki Goldman-Segall
Learning	4	6
Relational Thinking	10	9
respect environment	7	
Scientific Thinking	9	8

Figure 16: Topic chart

Seeing that she rated learning as important (or at least above 5) in this piece, I'm interested in understanding Ricki's conception of learning. I decide to search the database for other entries where she thought learning was important. I select

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[18] **Descriptor charts:** When the notions of significance rating and layering[5] were introduced into Constellations, we were faced with the challenge of making them accessible and useful. In looking at a spreadsheet program, Goldman-Segall realized that one important feature lacking in Constellations was a quick way of comparing different authors' layerings within a star.

With the implementation of collaborative layering, I was able to develop a spreadsheet chart display using an external called Tabloid, developed by Franco Rinaldi. One can display a chart for either the topics or participants within a star, which lists the topics in the rows, the authors in a column, and the corresponding values in the spreadsheet. If an author has not assigned a particular descriptor, that cell is left empty in the table. This allows a researcher to quickly see how the different authors in a database have described and layered the same piece of data.

"learning" from the list of topics and leave the rating filter set between 5 and 10. This search yields a list of stars, which I begin to look through.

As I'm looking through each of these entries, I notice that many of them also have relational thinking rated fairly high as a topic. About halfway through the list, I come upon a constellation Ricki made called "Learning." I'm curious as to the relationship, intentional or not, between "relational thinking" and "learning" in Ricki's data analysis, so I decide to attach a note[19] (Figure 17) to the constellation.

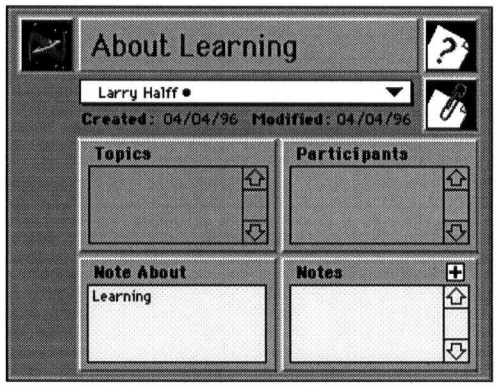

Figure 17: Note entry

How do I attach a note?

To do this, I click on the Add Note button (a plus sign next to the notes field in the entry information quadrant). This clears the database information quadrant and sets the area up for a new note. I title the note "Learning &

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[19] **Note entry:** One of the primary goals in redeveloping Constellations was to integrate notes people made into the database, so that they could be easily found in searches, rather than having to go to the place where the note was made in order to view it.

We accomplished this by making a note a database entry like a constellation or a star. In fact the entry is exactly like a star, except that it is identified as a note in the database and Constellations structures the way they are created and linked to other entries. What makes a note different from a star is that a note can only be created from another entry by pressing the Add Note button, and a note must be linked as a child to that entry.

Implementing notes as database entries allows them to be layered, found, and accessed like any other piece of data in Constellations, yet distinguished by their relationship to other entries within the database.

Relational Thinking." I want to write the note in a new text document, so I select Attach New Text[20] from the Entry menu.

I'm prompted with a standard Save File dialog box, so I name the file, create a new folder in the database folder called "Notes," and save it there. An empty text windoid appears in the data display quadrant. I type in some questions asking about what the concepts "learning" and "relational thinking" mean to Ricki and whether or not she sees an explicit relationship between them. Satisfied with my note, I save the entry. To get back to the original star, I double-click on its name, which appears in the Note About field in the entry information quadrant.

Looking at the list of entries, I want to see the data attached to each star without having to go back through the entire list. I can do this by looking at the map Ricki has made in the Constellation Designer,[21] so I choose Display Data

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[20] **Attaching a new text file:** When users create a new note, they most often want it to consist of some text. It is awkward to have to open a text processor, create a new file and save it, then return to Constellations and attach that file to the note entry.

The Attach New Text menu option allows a user to create a new text file on the fly and automatically attach it to the current entry. When a user selects this option, she is prompted with the standard Save File dialog box, where she must choose a name for the file and the location where she wants it saved. A new text file is created and opened in a text windoid in the data display quadrant. She can create her text in this windoid, and her work is automatically saved when she closes it.

[21] **Constellation designer history:** The ability to view a constellation as more than simply a text list of stars was a significant feature of Learning Constellations 1.0, which was lost in the development of the quadrant user interface. Inspired by a project of grade six students on Canada's railroads, I re-implemented this feature as part of the Multimedia Classroom's Project Backyard in the summer of 1993.

The project I saw depicted information from reports about Canada's railroads in drawings of a train with a series of boxcars, where each box car contained a piece of information about the railroad. I thought that this was strikingly similar to Constellations, where the train was a constellation and each car was a star.

With the original Constellations database there was no way for users to present all the results of their analyses — different stars gathered into constellations — on one screen, or to build links and navigate between different constellations in the database or in a presentation-type environment. (At this point in time the database did not support constellations being placed within constellations.)

I saw how these students had "mapped out" their "stars" on a two-dimensional plane, and thought that this would be an interesting way to develop a presentation system for Constellations. To implement this, I programmed a separate stack that runs concurrently with Constellations and

from the Entry menu, and the Constellation Designer window is opened, showing me Ricki's arrangement of these stars. This allows me to view all of the video clips together, which lets me get a better sense of how these pieces relate.

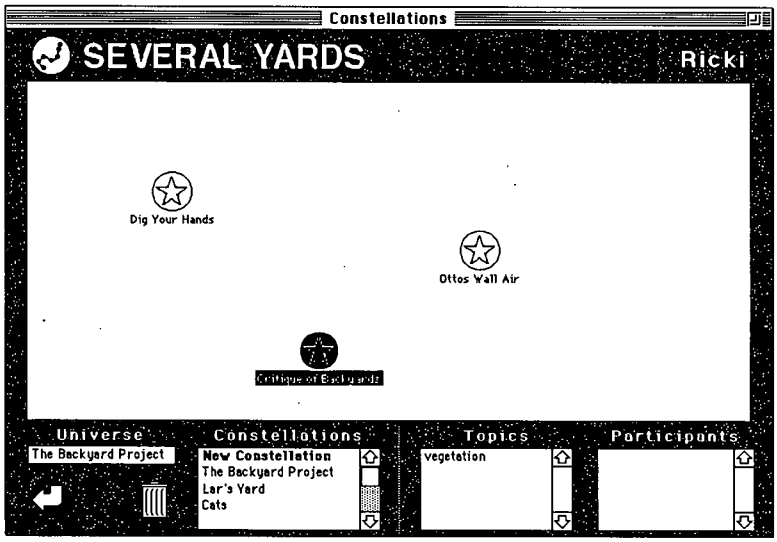

Figure 18: Original Constellation Designer

How do I use a URL as data?

One of the video clips in particular reminds me of a page I found on the World Wide Web. It is a video clip of an interview where one of the students at Bayside is talking about how she used the Internet to research some of the environmental issues which are important in Clayoquot Sound. I want to create a note for this star referring to the WWW page I found, which is a list of projects where students are doing research using Internet resources. First I have to open this star in Constellations, so I option-double-click on this star's icon in the Constellation Designer window. I am returned to the main Constellations window, where the star I selected is loaded.

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allows authors to create two-dimensional maps of constellations (Figure 18). It included a hack which allowed authors to link to other constellations within a map. The tools for linking constellations and navigating through the database made the window crowded. As I redeveloped the database structure, I streamlined the user interface, so that the Constellation Designer window now contains only two sections (title field and map area).

I click on the Add Note button and am presented with a blank note entry. I fill in the title, "Students & Internet Research." I open the program Netscape Navigator and find the page I want to use as the data for this note. I return to Constellations, and select Attach URL[22] from the Entry menu, which automatically opens the URL Palette (Figure 19). I click the Grab URL button, which reads the current URL loaded in Netscape and enters it as the attached URL, which I can see in the URL field in the palette.

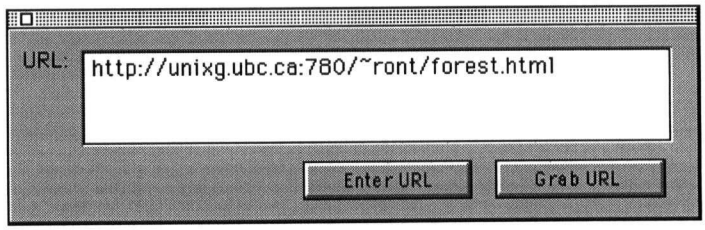

Figure 19: URL palette

I want to leave Ricki a comment about this URL, so I click the Author's Note button and leave a message saying that I thought she might want to let the people who maintain this list of links know about the kids' work at Bayside. I close the Author's Note windoid and save my entry.

Having explored Ricki's database for a couple of hours, I decide to end my first session of working with her data. It's interesting to see how she has layered and configured her data, and I'm looking forward to seeing her response to my layering and notes. Perhaps she will have looked at what I have done before I get a chance to continue my analytical journey.

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[22] **Attaching a URL:** While Constellations was being developed, the World Wide Web grew into an important research tool. We felt that it was important for researchers to be able to refer to information found on the WWW in their Constellations database, so we implemented the URL as a data type. This allows a researcher to read and load URLs from Netscape Navigator.

If a user opens the data palette for an entry and a URL is attached to this entry, Constellations opens up the URL palette, with the attached URL shown in the URL field.

To attach a URL to a star or a note, the user selects Attach URL from the Entry menu, which displays the URL palette. To attach the URL currently loaded in Netscape, the user presses the Grab URL button. To type in a URL, the user presses the Enter URL button.

CHAPTER 4

DE/COMPOSING CONSTELLATIONS

Looking over the shoulders of (imagined) researchers as they use Constellations only tells part of the story of Constellations and its development. In order to tell more of that story, in this chapter I analyze Constellations by looking at whether it has fulfilled the goals and visions its developers had for it from the outset. I also look at the unplanned positive and negative developments which occurred along the way.

I recently had a discussion with Ricki Goldman-Segall about what initially motivated her to develop another version of Learning Constellations. She told me that the impetus was to reconceptualize the note component and implement it as a more accessible element within the program. However, in the redesign of the note in Constellations, the balance between a localized, floating layer of information and a fully incorporated element shifted from one extreme to the other, making notes difficult to use and inaccessible in a different way.

In this chapter, I will trace the history of the development of Constellations 2.5, starting with the redesign of the note and examining the major design decisions along the way. I will assess how the redesign changed the program, focusing on how it conformed to the historical vision of the program, changed the vision of the program, and had positive and negative influences.

NOTES AND THE EMERGENCE OF A DATABASE

I will begin by discussing the redesign of notes in Constellations, not only because that was where Constellations 2.5 started, but also because the initial focus on implementing notes in a more integrated manner directed the course of the redevelopment of the program. As Goldman-Segall said in our discussion: "It's

a video annotation tool; that's what it's all about." Ironically, the redevelopment of Constellations in order to integrate notes into the program actually shifted the primary mode of video annotation away from specific notes and moved it towards other modes of video annotation.

In order to accommodate notes as searchable elements within Constellations, the program's structure had to be extended beyond that of an organization and presentation tool. Learning Constellations as it stood allowed Goldman-Segall to organize and present her doctoral thesis and the data she collected in the course of the research for her dissertation. While it allowed users to attach notes and arrange data into constellations, it was not an open, dynamic system in that it did not allow people to enter more "data."

The solution Goldman-Segall and Monika Marcovici used in order to better integrate notes into the system was to make notes star-like. To facilitate this, Constellations was restructured into a true database system. This meant that users had to be able to enter their own data, gather their own constellations, and create their own notes, which would be taggable and searchable, like any other entry.

When this change was made, the design of the tool began to focus on one of the functions to which databases are particularly well suited: sorting through data which has been coded in a standardized manner. The topic and participant tags, which started out as a feature of Learning Constellations, became both part of the design and theoretical focus of Constellations 2.5.

Tags, which we now refer to as descriptors, became a design focus because having a database with potentially quick, flexible search capabilities meant that one could easily sort through the data in the system, based on the descriptors assigned to them. Goldman-Segall then extended our implementation of descriptors, so that each descriptor could be given a rating in relation to the entry

to which it was assigned. The tool we implemented in Constellations to allow this is called the significance measure, and the conceptual analysis process used is called layering.

In discussing what had happened to the note feature, Goldman-Segall and I agreed that its reimplementation had been unbalanced. The notes were quite easy to use in Learning Constellations because one could quickly create and view them while examining the data, and they existed in a space that sort of "floated above" the rest of the data. In our attempt to make them easier to locate by placing them within the database structure, we made them more inaccessible, hidden in the database structure and hidden from user's view.

The current implementation of notes makes them inaccessible for because they are difficult to create and view. You cannot just open a window and jot down some information or designate a section of video. You have to create a new database entry, which clears the screen of the piece of data with which you were working, and you have to go through the process of naming the entry, defining a data file, and layering (if you want to make it accessible in a search).

Now, in retrospect, the advantages gained in the current implementation of notes — that the user can search for notes and make notes about notes — do not justify the problems it generates. In the larger picture, however, the way in which this redesign influenced the development of Constellations was positive, particularly as it facilitated Goldman-Segall's retheorization of video annotation and analysis. If we had not focused our development efforts on creating a data analysis tool structured around the kind of database we were developing, we might never have conceptualized or implemented layering and the significance measure. Aside from being an important concept in itself, layering is also one of the key elements of Goldman-Segall's theory of multimedia data analysis,

configurational validity, which she describes in her article "Configurational Validity" and in her upcoming book, *Points of Viewing*.

Four Quadrants and Interface Consolidation

Constellations' metamorphosis into a database system brought about many other significant changes in its design. The most visible of these was the development of the quadrant system for the user interface. In Learning Constellations, users could navigate between several different kinds of pages to examine the data in different ways. Users could view the data with a linear narrative approach by reading Goldman-Segall's thesis, and view the video segments (stars) that were placed in different locations in the text. They could see what different groupings of stars were important to Goldman-Segall or arrange their own groupings of stars. They could also access the raw collection of stars itself. All of these different functions could be accessed from a "front door" to the interface called the Galaxy Map.

The structuring of Learning Constellations using the Galaxy Map was particularly well suited to the program's mixture of fixed content and limited user interactivity. It allowed the user to gradually become familiar with Goldman-Segall's dissertation before having to master, both conceptually and technically, the more complicated interactive features of Learning Constellations.

Constellations in its new form was not suited to this multipage approach for two reasons. First, the database is open and researchers can use it to analyze their own data. Different collections of data are suited to different navigation infrastructures. A single navigational front end cannot be used for all of the different data collections which Constellations is designed to analyze.

Second, the analytical and creative functions are greatly expanded. Constellations users can do more than Learning Constellations users. Most significantly, they can create and layer stars and do complex database searches. Since these functions are closely related in the data analysis process, it becomes awkward to have to move between many different pages to do these different things.

Realizing that the user interface which had been developed for Learning Constellations was inappropriate, we were faced with the problem of making all of the information and functions of Constellations easily accessible by the user. During this redevelopment process, we began working with Scott Flynn, a graduate student working with Professor Kellogg Booth at the Media and Graphics Interdisciplinary Centre at U.B.C. Flynn used a NeXT computer to develop a prototype of the new Constellations, in which he arranged all of the components of the database into one window.

The window was divided into four quadrants. In the top half of the screen were two sections which allowed users to navigate the disk's file structure and select a data file. When one selected a data file, the program would display information it had attached to each file (such as descriptors) in the bottom left-hand quadrant and show the file in the bottom right-hand quadrant. While Flynn's prototype did not implement a true database structure (stars were not objects within the program; the system stored additional information about files on one's computer), it did logically fit all of Constellation's functions into one window.

After looking at Flynn's work, we decided that this was a good solution for making all of the program's functions easily available to the user. We rearranged and reinterpreted his four quadrants to form the current basic structure of the program. We moved what had been the bottom half of the screen to the top half,

so that one finds a star's information and the display of the file attached to the star in the top left-hand and top right-hand corners of the screen.

We redesigned the top half of the screen, where one would select files in Flynn's prototype, into a system for searching and listing the entries stored in the database. The bottom half of the screen still retains the visual structure of NeXT browser, with its series of columns of information.

Breaking Constellations' functionality into four different parts — database searching, database listing, information display, and data display — allowed us to develop a usable and logical interface for the program. But it is not completely problem free. The most visible problem is that we took NeXT interface design standards and tried to recreate them in a Macintosh environment. The Macintosh user interface is not suited to the kinds of interface structures found on the NeXT, and Macintosh users are not used to interacting with the computer in NeXT-like ways. One example of this user interface grafting is our translation of Flynn's file selector, which used the standard NeXT browser interface, into our database access quadrant.

The Macintosh handles both searches and file selection very differently. A standard search in the Finder is executed by building a list of search terms, item by item (Figure 20). Files are usually viewed as selectable and draggable icons and grouped into folders which appear as separate windows (Figure 21). Since we did not implement the standard interface structures, searching and item manipulation in Constellations is awkward to program and can be difficult to learn.

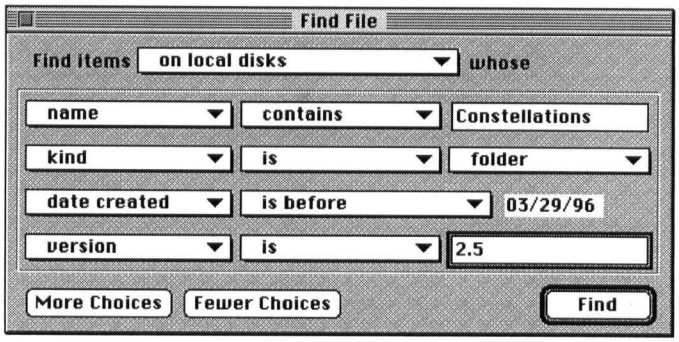

Figure 20: Macintosh file search

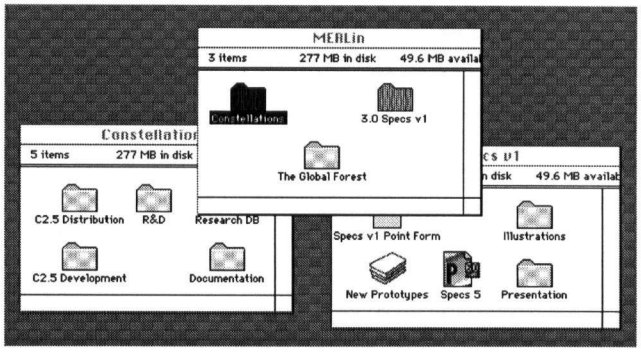

Figure 21: Macintosh Finder windows

Finally, in the restructuring of the interface, the Galaxy Map, which allowed the user to begin viewing the data in several different ways, and the Constellation page, where a researcher could present data in a structured manner, were lost. The Constellation page was redeveloped as the Constellation Designer, but it works much like the notes did in Learning Constellations. There is no quick way to view constellation maps; one must view them by first going to the constellation in the database and then opening the Constellation Designer.

In the summer of 1994, we hired a C programmer to redevelop Constellations as a native application. In designing the next version of the program, which I discuss in my conclusion, we addressed many of the user-interface problems that make Constellations 2.5 difficult to use. When we began the design of the new Constellations, we stopped reviewing and critiquing the design of Constellations 2.5. This became a problem, as the development of the next version did not proceed as quickly as we had planned. Since we had focused all of our efforts on

the development and critique of the design of the next version, we hadn't discussed any future possibilities for the current version of Constellations.

Because of the delay in the development in Constellations 3.0, in the spring of 1995 we decided that I should keep working on Constellations and develop it into a fully functional prototype. This required major changes to the user interface, which I implemented without feedback from other users, due to time constraints. While many of these changes made the program more Macintosh-like, in some ways the user interface became more obscure. The combine search function is particularly hard to understand, and dragging descriptors from the database access quadrant to the entry information quadrant is unintuitive.

Despite the problems in the design and implementation of Constellations, I feel that we did accomplish our goals in the development of Constellations 2.5. First we developed a fully functional prototype of a collaborative multimedia data analysis tool. Even though the user interface is problematic, all of the basic functions and internal structure of the program have been designed. We have created a simple database structure around an easy-to-understand metaphor, where pieces of data are represented as stars and collections of data are represented as constellations. We have developed a model for collaborative data analysis, based on layering, where different users can annotate common elements in the database. The program supports different kinds of data, including documents on the World Wide Web. Finally, we have developed a system with which to organize and present collections of data in the Constellation Designer. Our work has also been instrumental in Goldman-Segall's development of one of the first theories of multimedia data analysis: configurational validity.

Developing these analytical structures and theories is the most important part of research-based development. The specifics of software and computer technology are in constant, rapid flux. The conceptual structures and theoretical

framework can now be applied to applications which are suited to emerging models in software development. In my conclusion, I will discuss possible future applications of the Constellations model of data analysis.

CONCLUSION

RE/COMPOSING CONSTELLATIONS

The completion of Constellations 2.5 is really just the beginning of the development of Constellations as a fully operational data analysis tool with all features in place. Constellations 2.5 allowed those of us who have been working at MERLin to develop a coherent conceptual structure for multimedia data analysis, especially in our experiences in designing the Constellations database and Ricki Goldman-Segall's development of the concept of configurational validity.

HyperCard's suitability for prototyping allowed us to explore the various possibilities for creating Constellations, but HyperCard is not quick enough or stable enough to function as a platform on which to develop a robust tool which will support all of the functionality of the Constellations system. In order for us to be able to develop this method of data analysis further, the program has to be redesigned and developed in other ways and environments. In this chapter I outline two possibilities for the redesign of Constellations. First I describe the current effort to develop a version of the program as a native application with a full range of features. Then I discuss the potential of building a Web-based user interface for a Constellations database.

CONSTELLATIONS 3.0

In the summer of 1994, we made the decision to phase out the development of Constellations as a HyperCard application, hired a C programmer, and began the design and development of Constellations as a run-time Macintosh application. That fall, under the guidance of Ricki Goldman-Segall, I began the process of developing written specifications for Constellations 3.0 (See Appendix B). These were completed in the spring of 1996. The specifications for the new

version of Constellations feature three major design changes in the interface and operation of the program.

A New Look

The most visible change to the program is making the user interface more Macintosh-like. Instead of having one window where all of the functions of the program are located, Constellations 3.0 offers a suite of windows. The user can have as many different entries as necessary open for viewing at once. These windows are collapsible, so that while the window is open, one can view either just the basic information about an entry, or all of the information and data associated with that entry (Figure 22).

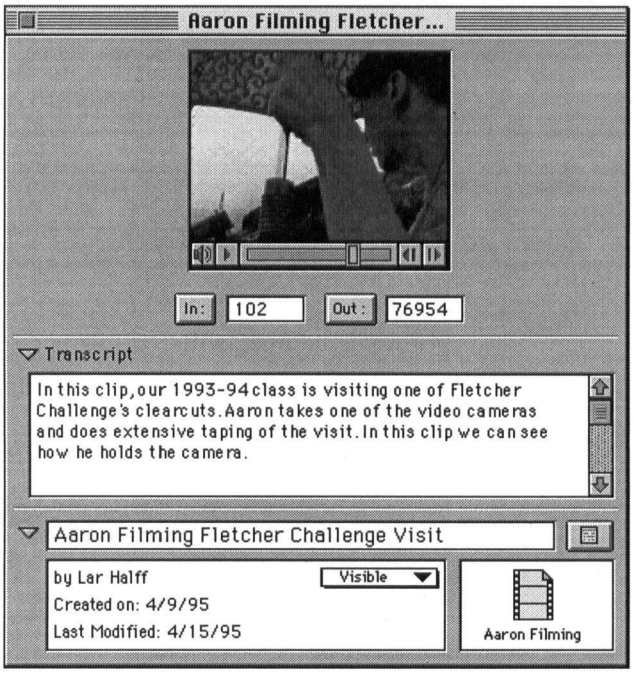

Figure 22: Constellations 3.0 star entry

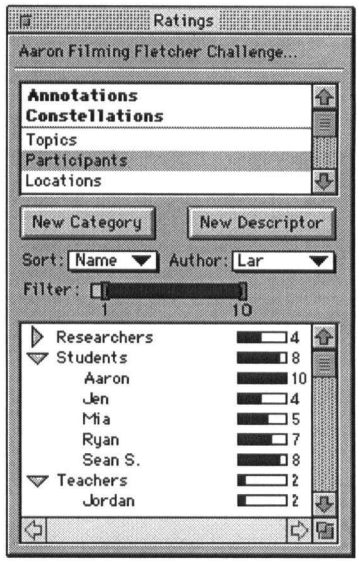

Figure 23: Rating palette

The layering functions have been placed in a floating palette (Figure 23). This palette displays the layerings of the entry that are in the front-most window. The palette allows the user to view ratings, which are shown in the bottom. A user can dynamically filter descriptors by rating and sorting the list by name or rating.

Furthermore, an author can layer an entry by selecting her name from the author menu and dragging the dynamic scale located to the right of the descriptor name. New descriptors can be added to the list using the New Descriptor button.

Hierarchical Descriptors

The second enhancement to Constellations is the implementation of hierarchical descriptors. In place of the two fixed descriptor categories in Constellations 2.5 — topics and participants — one can define as many different types of categories as one needs. Descriptors within categories can have multiple levels of subcategories (e.g., if "students" is a participant descriptor, "Mia" could be a subdescriptor). This allows the user to create rich, detailed layerings of the data.

Expanded Search Capabilities

Constellations 3.0 also features enhanced search capabilities. The user now defines a search in a separate window (Figure 24). She can select as many authors and descriptors as she wishes and limit the ratings to those within a certain range. She also has the option of searching by plain text keyword. This entails a search of all of the fields associated with an entry for that keyword. Items found in a search appear as icons in a window, much like files in a folder in the Finder.

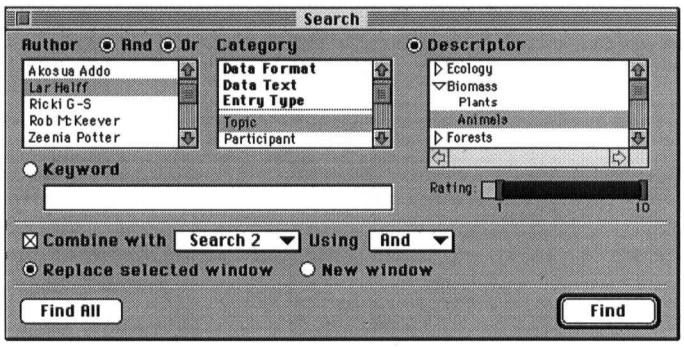

Figure 24: Constellations 3.0 Search window

These search results can be stored by the program so that they can be used from session to session. A user can combine a new search with the contents of a window generated by a previous search using the same logical operators found in Constellations 2.5 (AND, OR, and NOT). Although these improvements make searches more functional and easier to use, the search function could be made better still if the user could view a visual history of her combined searches in order to keep track of the meaning of the search results.

Constellations 3.0 is currently under development. Its completion will mark the end of the current phase of development of Constellations as a consolidate application.

Constellations and the World Wide Web

Over the past year, the World Wide Web has become a common platform for the exchange of information between colleagues working around the world. Not only can people publish rich multimedia information; they can also interact with Web-based applications using forms to search and enter information into databases.

With enhancements to the HyperText Markup Language developed mostly by Netscape Corporation, such as forms which allow different kinds of information or different kinds of user interaction to be placed in separate areas in one window, complex user interfaces can be built with which to access these applications.

Constellations is an ideal Web-based application. Making it available on the Web would allow researchers from all over the world to collaborate in analyzing the same sets of data. Data display and handling would be simplified; data references would be URLs, commonly accessible and displayable by everyone.

Finally, there would be no operating system barriers, as there are Web browsers for all of the major operating systems available.

Constellations as a State of Mind

Although Constellations is an actual computer program, with specific functions and features, it also embodies a way of organizing and thinking about information. The epistemologies expressed in Constellations can be seen in the different aspects of the program's design and functions. The most obvious epistemological components of Constellations are granularity and configurational validity. Granularity, the notion that large blocks of information can be divided into smaller pieces which give data its meaning, is the conceptual basis of the star, a discrete piece of data which has set boundaries. Configurational validity, the notion that pieces of data and interpretations can be arranged and rearranged to form new interpretations, is the key concept in layering and constellation building, where a researcher builds interpretations of her data by sifting through layers of interpretation (defined by the way stars have been tagged) to create groupings of stars.

Other epistemological influences can be seen as well, particularly in the way Constellations, using the Constellation Designer, encourages the presentation of data in its shifting configurations as an integral part of the research and data analysis process. This aspect of Constellations evinces the influence of both Briggs's argument that data analysis should be concurrent with and inform the research process, and Trinh's documentary aesthetic, in which the visual style of a piece of data and its presentation determine its "truth." It also shows the influence of Butler's notion of gender performativity, in which knowledge is generated in a stream of performances, or presentations, which either repeat or interrupt our current conceptions.

While these epistemologies are intertwined with their concrete expression in Constellations 2.5, they can also have an existence beyond the material details of this particular implementation. As I've shown in my discussion of the possibilities for the redevelopment of Constellations, the concept of "constellations" can be applied to create information-organization systems in dramatically different environments.

Constellations is not unique. Every piece of software embodies at least one epistemology. Word processors, communications applications, spreadsheets, and graphics programs are all developed with their creators' own particular views of what information is and how it should be handled. It is important to recognize this and to included in our software development practices the element of reflection upon the history of the tools we construct. This will not only allow us to develop tools that are more effective and easier to use; it will also give us greater understanding and control of how emerging technologies are shaping future epistemologies.

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APPENDIX A

A BRIEF OUTLINE OF THREE VIDEO ANALYSIS TOOLS

TIMELINES

Concept

TIMELINES allows a real time annotation of a stream of video. This means that a researcher places markers at certain points in the video while viewing it. The researcher can explore the way they have annotated their data by viewing it either in table format or as a graphical representation

Key Features

- TIMELINES controls the playback of video data.
- Buttons can be created which allow a researcher to quickly place event markers at a specific points of time or spanning an interval of time while viewing the video.
- Detailed notes can be attached to specific times in the video.
- The user can view and navigate a graphic representation of the annotation of a stream of video.
- The user can view and sort a tabular representation of the markers placed in a stream of video.
- The user can for specific markers.
- The user can view an overview summary of multiple videos annotated using the timelines system.

MacSHAPA

Concept

MacSHAPA is a spreadsheet database. Each row represents a segment of time and each column represents a variable type. Variable types and formats are defined by the user, allowing for flexibility in the kinds of information she attaches to the time segments. Variable contents are coordinated to the time code rows in the cells of the spreadsheet.

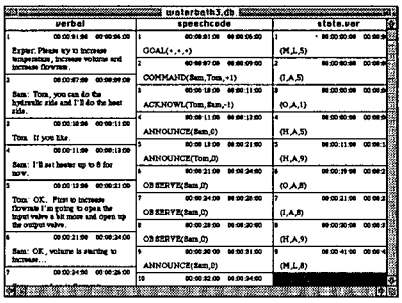


Figure 25: Main MacSHAPA window

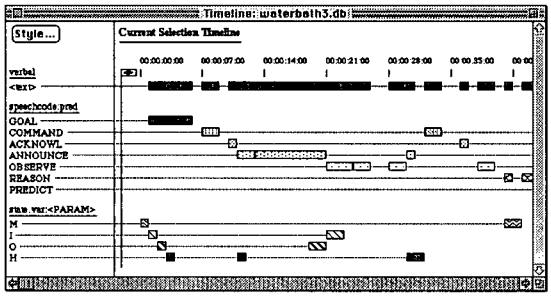


Figure 26: MacSHAPA timeline

Key Features

- MacSHAPA can control a VCR and automatically import video time codes.
- Codes and qualitative data can be manually entered into the spreadsheet or imported form another file.
- Data within the spreadsheet can be filtered and changed.
- There are simple textual and graphical reports.
- Reports are hot linked to the spreadsheet: selecting an item in a report selects the appropriate cell in the spreadsheet.
- Custom statistical reports can be generated.
- A query language can be used to count codes or look for patterns and to modify data in the spreadsheet.

NU•DIST

Concept

NU•DIST allows a researcher to arrange their data in a tree-structure. Pieces of data are indexed by key concepts. These concepts are arranged in a hierarchy of categories. Where a piece of data is located in the tree structure is determined by the index tags assigned to it.

Key Features

- Supports a multimedia data: text, audio, graphics, and video.
- A VCR can be controlled to show via CVideo.
- A user can view summary information about the whole data collection.
- Search results can display contextual information about the found data.
- Searches and queries of the data can become part of the data tree
- Different segments of information in the tree can be linked.
- Theories developed about the relationships between different pieces of data can be tested using an index search system.
- Repetitive data handling tasks can be scripted.
- Memos can be written to exchange comments about the database.

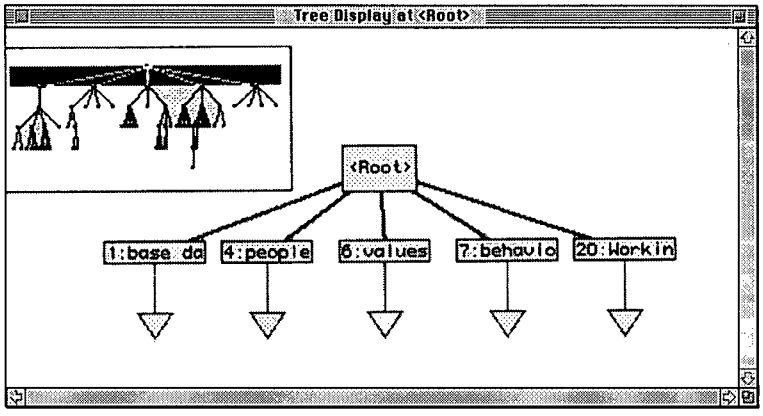


Figure 27: Tree Display window in NU•DIST

The Multimedia Ethnographic Research Laboratory
at The University of British Columbia

Constellations 3.0
Program Specifications

may 12, 1995
version 1, revision 0

Lawrence Halff

Table of Contents

Author's Note

This document outlines the basic structure and usage of *Constellations 3.0*. Many details have been intentionally not discussed. These either follow from convention or logic, or will be described in further technical specifications as the need arises. Rather than try to discuss each minute element of every piece of the user interface, it has been my intention to produce a document which makes clear how a user moves through the program, the components they interact with, and how these components fit together.

Program Overview

Introduction

Constellations is data analysis database which allows a community of researchers to layer, organize and exchange feedback about a common set of digital data in many possible formats.

Basic Structure

Three Functions:

- Catalogue pieces of data stored on the computer in digital format.
- Organize these pieces of information (and other groupings) into meaningful groupings.
- Search for, browse through, and comment on information contained within the database.
- Each of these three functions represents a kind of entry within the database: Stars, Constellations, and Annotations

Star

- Refers to a computer file.
- Name.
- Author.
- Creation and modification date.
- Selection range.

Constellation

- List of other Stars or Constellations.
- Coordinate position of items.
- Name.
- Author.
- Creation and modification date.
- "Entry point" check.

Note

- Refers to another database entry.
- Refers to a computer file.
- Name.
- Author.
- Creation and modification date.
- Selection range.

Constellations will support

- QuickTime files.
- Styled text files.
- System 7 sounds files.
- PICT and JPEG image files.

Layering

In addition to organizing these three types of data, *Constellations* allows the user to describe these three types of data in a process called layering. Layering allows the user to assign a numerical rating signifying the importance of two items' relationship.

Descriptors (key words)

- Rated in relation to the database entry.
- User defined.
- Appear in different categories (user defined).
- Hierarchical.

Stars

- Rated in relation to the constellations in which they appear.

Program Overview

Layering (cont.)

Constellations
- Items within a constellation are rated in relation to the constellation as a whole.
- Rated in relation to the constellations in which they appear.

Annotations
- Rated in relation to the entry to which they refer.

The Research Community and Sharing Data

Constellations is designed to be used by a community of researchers, who are viewing, layering, and organizing the same pieces of data.

Multi-user features
- Keep track of multiple users and passwords.
- Users individually layer each piece of data.
- Allow users to see other user's layering.
- Prevent users from modifying each others' layering.

Privacy Levels
- Private entry is only visible to the creator and cannot be found in searches or viewed by anyone but the creator.
- Visible entry can be found and viewed by anyone, but can only be layered and placed in constellations by the creator.

Privacy Levels (cont.)
- Public entry can be found, viewed, layered, and placed in constellations by anyone.
- No one can change the name, file reference, or data range of an entry which someone else has created.

User Types
- A Guest user can only view entries, has no name.
- A Commentator user can view entries and make and layer notes, and save entry lists. They create themselves in log-in dialog.
- An Author can view entries, make and layer all types of entries, and save entry lists. They are created from commentator by the Database Administrator.
- A Database Administrator created the database. She or he can modify user types, can delete descriptor categories and descriptors.

Basic User Interface Elements

Star Window

The star window is divided into three sections: the data, the description, and entry information.

Data Section

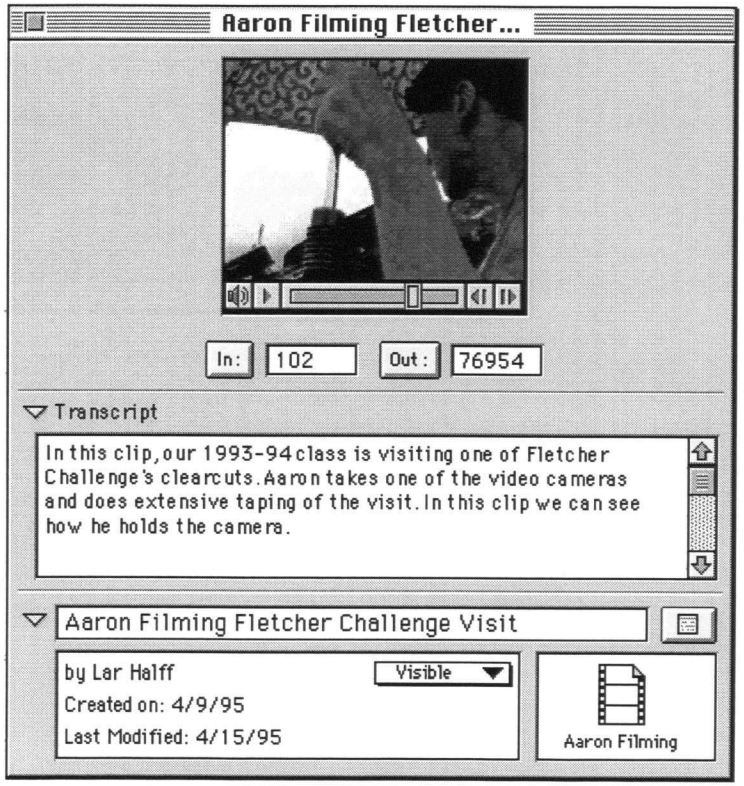
- Data is displayed if the format is supported by Constellations.
- If the file format is not supported, the file's icon and name are displayed. Double clicking on the icon will launch the file with the application with which it was created.
- Toolbar with range settings and other tools depending on data type.

Transcript Section (collapsable)

- Scrolling, styled text field.

Information Section (collapsable)

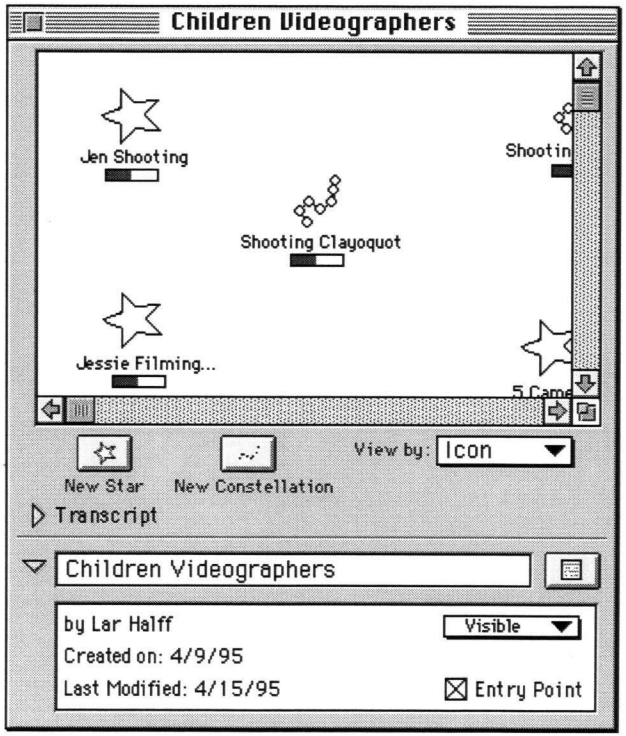
- Fields: Name, Author, Creation date, Date last modified.
- Pull down menu: set privacy level.
- Data file box.
- "New Note" button creates new not about this star.



Basic User Interface Elements

Constellation Window

A constellation window is the same as a star window, except for the data section and parts of the information section.



Data Section

- Scrollable and resizeable pane displaying the items contained in this constellation Toolbar.
- "View by" pop-up menu: Icon, Rating, Name, Author, and Date Modified.
- "Add Star" button: add a blank star.
- "Add Constellation" button: add a blank constellation.
- If the item is a star, Double-clicking on entry will bring up small data window. Option-double-clicking on entry will open the entry's window.
- If the item is a constellation, double-clicking on the entry will open the entry's window.
- Names can be edited as in the finder.
- Ratings can be set by click-hold-dragging the rating thermometer

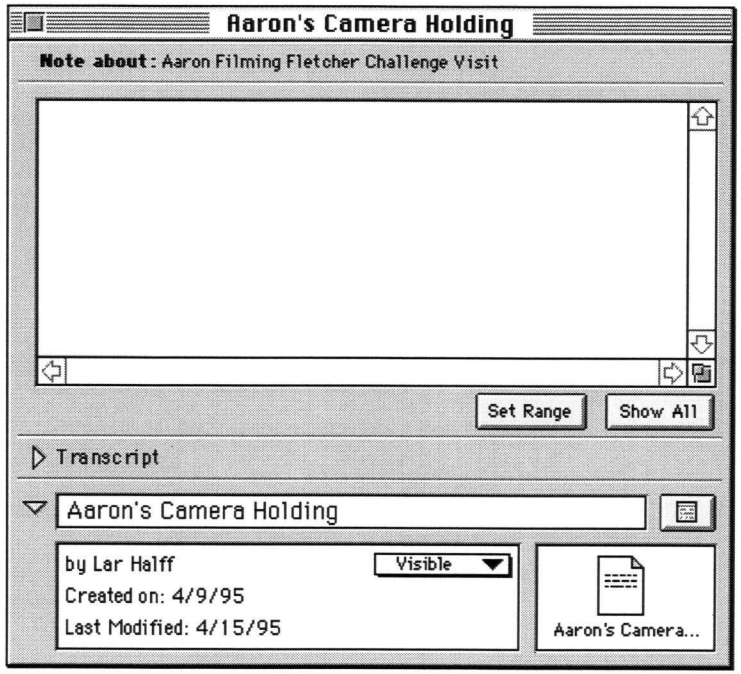
Information Section

- "Entry Point" check box.
- No data file box.

Basic User Interface Elements

Note Window

A Note window is the same as a star window except that it shows which entry it refers to above the data section.

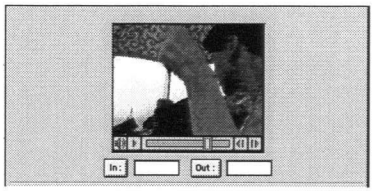


Basic User Interface Elements

Data Panes

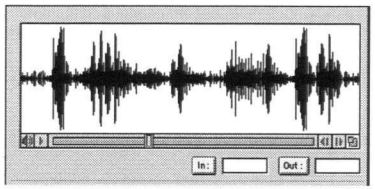
QuickTime Toolbar

- "Set In" and "Set Out" buttons set in and out points to current controller position. If a range is selected, point is set to either the beginning or end of the range.
- "In Point" and "Out Point" fields display numerical in and out points. The fields are manually editable.



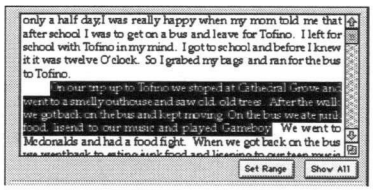
Sound Toolbar

- "Set In" and "Set Out" buttons set in and out points to current controller position. If a range is selected, point is set to either the beginning or end of the range.
- "In Point" and "Out Point" fields display numerical in and out points. The fields are manually editable.



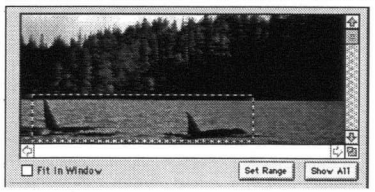
Text Toolbar

- "Set Range" button sets the in and out points to the beginning and end of the selected text and displays only that text.
- "Show all" button displays the entire text and shows the selected the range.



PICT and JPEG toolbar

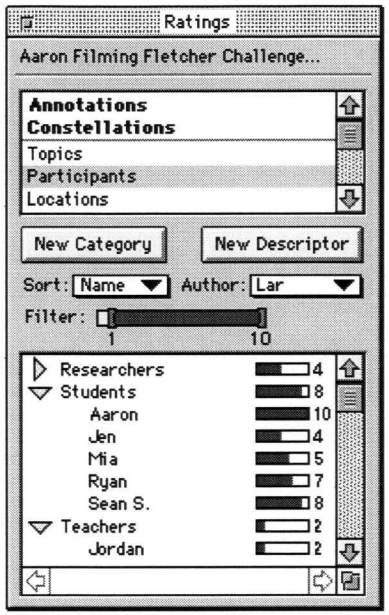
- "Set Range" button sets the "in" and "out" points to the beginning and end of the selection and displays only that part of the image.
- "Show all" button displays the entire picture and shows the selected the range.
- Fit In Window check box resizes the picture to fit in the window.



Basic User Interface Elements

Rating Windoid

The rating windoid is a floating palette which allows the user to view and change the ratings for the foremost entry. It is divided into four sections: the Entry Name, the Category List, the Toolbar, and the Descriptors List.



Entry Name section

- Displays the entry which is currently being layered.

Category List section

- Lists the categories and connections which can be rated.
- If the entry is a star, you can rate: notes about that star, constellations of which that star is a member, and descriptors.
- If the entry is a Constellation, you can rate: notes about that constellation, constellations of which that constellation is a member, items contained within that constellation, and descriptors.
- If the entry is a Note, you can rate: notes about that note, the item to which that note is referring, and descriptors.
- If foremost window is not a database entry, descriptors appear without ratings. The rating filter and the author pop-up menu are disabled.
- Double-clicking on a category presents dialog to change its name.

Toolbar section

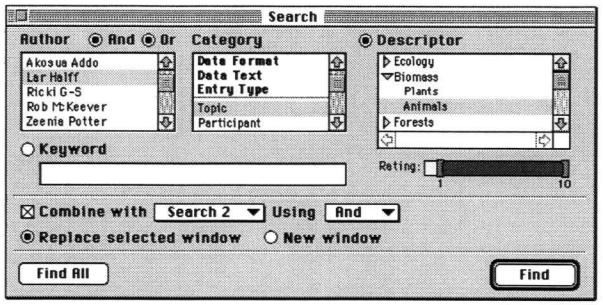
- "New Category" button defines a new category.
- "New Descriptor" button defines a new descriptor within selected category. Cross-hair cursor and click to position.
- "Sort" pop-up menu sorts by Name or Rating.
- "Author" pop-up menu selects which author's ratings are displayed.
- Filter selects the items to be displayed by rating.

Descriptor List section

- Displays possible choices within category chosen from category list.
- Option-drag to reposition a descriptor.
- Double-clicking on a descriptor presents dialog to change its name.

Basic User Interface Elements

Search Window



Author List

- Defines whose ratings are used in the search.
- One or more authors must be selected.
- "Or" ("And") returns entries which meet the requirements in any (all) selected authors' ratings.

Category List

- Lists all of the descriptor categories and Data Format, Data Text, Entry Type, and Name.
- When the "Keyword" radio button is selected, more than one category can be selected.

Descriptors List and Radio Button

- Lists all of the available descriptors or options in the selected category.
- When the "Descriptor" Radio button is selected one or more search terms from the chosen category can be selected.
- Data Format and Entry Type must use a Descriptor List search.

Keyword Field and Radio Button

- When the "Keyword" button is selected, a text search term can be entered by the user.
- Name and Data Text category searches must use a Keyword search.

Rating Slider

- User must select range in which the descriptor(s) have been rated by the selected author(s)
- Only applies to descriptors.

Combining Searches

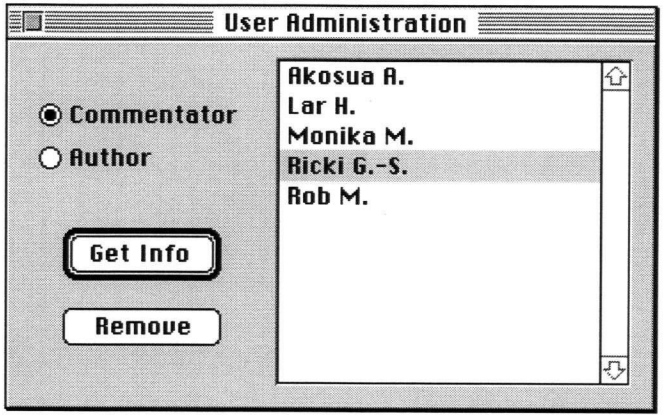
- Searches can be combined with other open lists of entries by checking the "Combine With" check box and selecting the desired list from the pop-up menu.
- The can be combined using either "and" or "or" by selecting the desired option from the "Using" pop-up menu.
- The combined search result can either replace the contents of the selected entry list or be placed in a new window.

Find Buttons

- "Find" will executed the search defined in the window.
- "Find All" will return all of the entries in the database.

Basic User Interface Elements

User Administration Window



User List
- Lists all of the users in the database.
- Double-clicking on a user will show the user information dialog for that user.

User Type Radio Buttons
- The Database Administrator can determine the selected user's type by selecting one of these buttons.

Get Info Button
- Displays a dialog box with information about the user.
- When the user was first created.
- How many times and when they last used the database.
- How many of each type of entry and how many entry lists they have in the database.

Remove Button
- Removes a user, all of their entries and layering, and all of their entry lists.

Basic User Interface Elements

The Menubar

Priviledges Key: *c* - commentator (within prescriptions)
a - author
m - database manager

File Menu
- New Database...
- Open Database...
- Close Database
- -
- Log In...
- Log Out
- Change Password... *c*
- -
- User Administration... *m*
- -
- Page Setup...
- Print...
- -
- Quit

Edit Menu
- Undo
- -
- Cut
- Copy
- Paste
- Paste Special
- Select All
- -

Edit Menu (Cont.)
- Duplicate *c*
  - Whole Entry
  - Basic Entry

Database Menu
- Find...
- -
- Open...
- Close
- Save *c*
- Save As... *c*
- Revert *c*
- -
- New Entry List
- Entry Lists

Entry Menu *c*
- New Star *a*
- New Constellation *a*
- Make Note
- Make Constellation *a*
- Delete Entry
- -
- Attach File...
- Attach New Text File...

View Menu
- by Icon
- by Name
- by Author
- by Type
- by Data Type
- by Date
- -

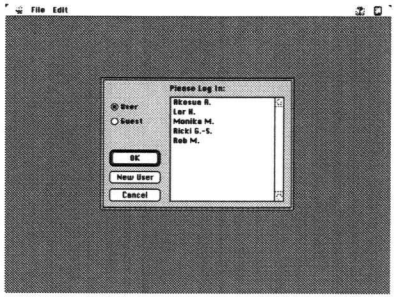
Descriptors Menu
- Open Descriptors Palette
- New Category *a*
- New Descriptor *c*
- -
- Delete Category *m*
- Delete Descriptor *m*

Text Menu *c*
Font
Size
Style

Using Constellations: Searching, Browsing, and Notes

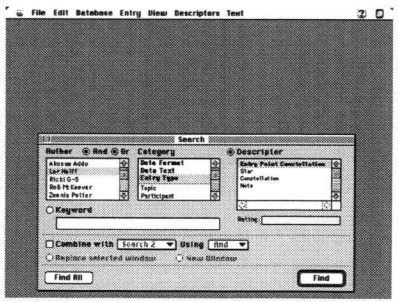
Launching Constellations

1. You launch the application.
2. A standard get file dialog box asks you to open a database
3. A dialog box asks you to log in.
4. You press new user. You are asked to enter a user name and a password. Another dialog box asks you to verify the password.
5. You are logged into to the database as a commentator, and the search window is automatically opened.



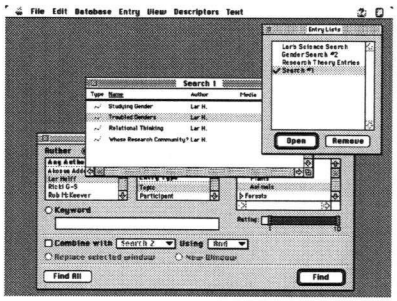
Searching the Database

1. The category Entry Type is selected. All of the options in this category are displayed in the Category list.
2. The option "Entry Point Constellation" is selected and the rating slider is greyed out. Searching for Entry Point constellations will present me with starting points in the database.
3. "Lar Halff" is selected in the Author list. Only the Entry Point constellations created by Lar will be returned.
3. "Combine With" is not checked, as there are no previous searches with which to combine.



Using Constellations: Searching, Browsing, and Notes

Using Entry Lists



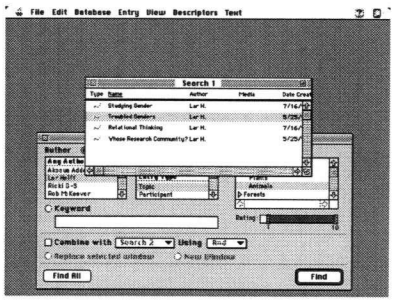
1. The search will present you with a window containing a list of entries which meet the requirements you defined in the search window. These lists, entry lists can be saved between sessions.

2. When an entry list is the front-most window, you can save it by selecting "Save" from the "Database" menu. The first time you save a list you will be prompted for a name.

3. To retrieve an entry list, select "Entry Lists..." from the "Database" menu. This will open the "Entry Lists" palette.

4. Using this palette, you can open entry lists and remove entry lists which you have created.

Opening an Entry



1. Entries in a list can be viewed either as icons, as in the finder, or a text list as seen to the right. You can select how you want to view the list from the "View" menu.

2. Constellations supports an open view architecture, so different ways of viewing lists of entries can be developed in the future. These "plug-in" views will appear at the bottom of the view menu.

2. Double-clicking on an entry from an entry list window or choosing "Open Entry" from the Database menu will open the selected entry.

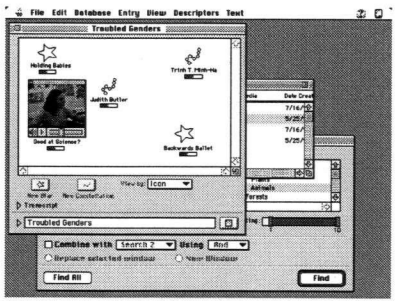
Using Constellations: Searching, Browsing, and Notes

Browsing a Constellation

1. When opened, you are presented with the constellation's window as it was last viewed. In this case you see a map of the items contained within the constellation.

2. Double-clicking on a star will bring up the data of that star in a small "window within a window." Double-clicking a constellation will open that constellation's window.

3. To open a star's window, we option-double click on its icon.



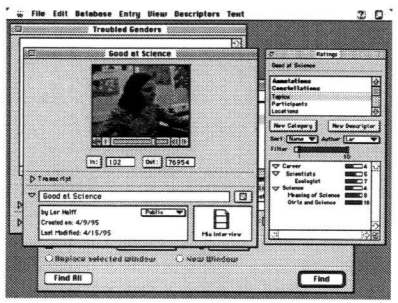
Browsing a Star

1. Once a star window is open you can view the data it represents, its transcript and the information about it.

2. By opening the Rating Palette from the "Descriptor" menu, we can view how the author (and others) have layered this video.

3. Double-clicking on a descriptor in the list will automatically perform a database search for all of the entries which the selected author has rated in the specified range, and place the results in a new item list window.

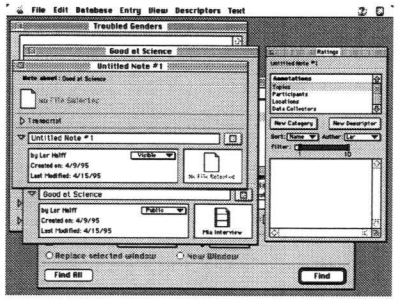
4. If a connection category is selected, double-clicking on an entry will open that entry's window.



Using Constellations: Searching, Browsing, and Notes

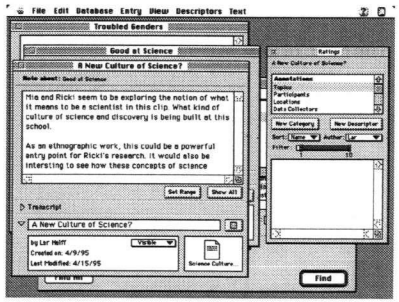
Creating a Note

1. To make a note about this star, you click on the "Make Note" button next to the Title, or choose "Make Note" from the "Entry" menu.
2. This will bring up a blank note named "Untitled Note #1." It automatically refers to the star from which it was made.
3. Notice that a blank file Icon appears in the data section and data file box, and that the rating palette updates its information to reflect the descriptors which apply to the new front most window.
4. Once a blank note window is present you can attach a data file and fill in information about that note.



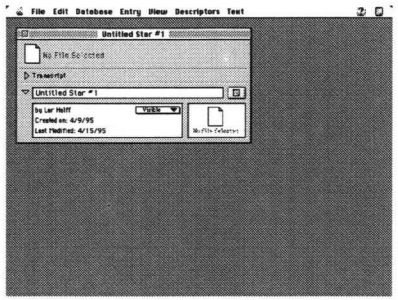
Filling in a Note

1. You can attach a previously composed file by dragging it from the finder into the data file box or data section of the window, selecting "Attach File..." from the "Entry" Menu, or clicking on the blank file icon.
2. You can create and attach a new text file to this entry by choosing "Attach New Text File..." from the "Entry" Menu.
3. To name the note, type in the desired name edit box in the information section. Layering will be discussed in the next section.
4. To save your note, choose "Save" from the "Database" menu or press command-S.



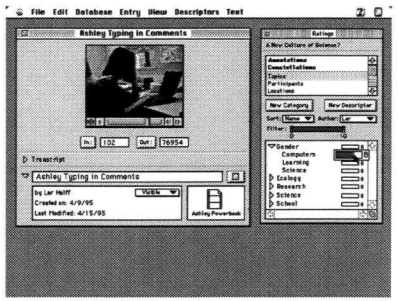
Using Constellations: Creating and Layering a Star

Making a New Star



1. Assuming you have now become an Author, you can enter your own data files into the database. Once your files are prepared, launch *Constellations*, open the database, and log in.
2. Select "New Star" from the "Entry" menu or type command-N. This will bring up a blank star window named "Untitled Star #1."
3. You can now attach the data file the same way you can attach a file to a note. You can name the entry the same way, as well.

Layering - Rating Topics



1. To layer this star open the Rating Windoid.
2. By default, the rating windoid appears with your name selected as the author and the rating slider set from 1 to 10. We select the category "Topics," but since we have not rated any descriptors in relation to this star, the descriptor list is empty.
3. To get a list of all the available topics, we set the rating slider to show us everything between 0 and 10.
4. We can now see the entire list of topics, and expand and collapse successive levels of sub-topics by clicking on the outline triangles.
5. To rate a topic, we click and hold down until a large rating thermometer appears. We then drag it to the desired rating and release.

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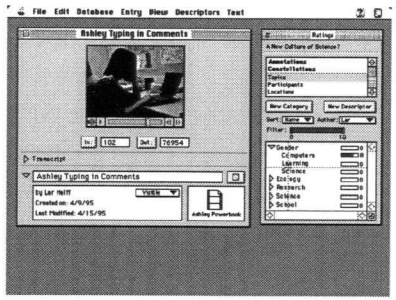
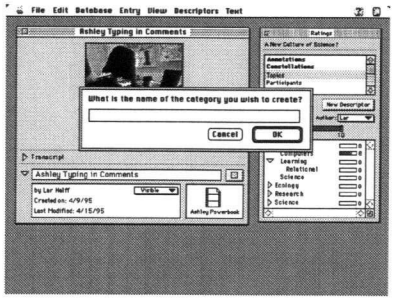
Layering: Creating a Descriptor



1. If you can't find the topic you want on the list, you can create a new one. Press the "New Descriptor" button in the Rating Windoid or select it from the "Descriptors" Menu.
2. A dialog box will ask you to enter the name of the new descriptor.
3. The cursor will become a cross-hair and guidelines will show you its position in the descriptor list.
4. You can now position the descriptor at the appropriate place in the descriptor list. When it is positioned, click the mouse button.
5. It is now placed in the descriptor list and given an initial value of 0.

Layering: Creating a Category



1. If there isn't even a category to list the descriptors you wish to use, then you can create a new one. Press the "New Category" button in the Rating Windoid or select it from the "Descriptors" Menu.
2. A dialog box will ask you to enter the name of the new category.
3. The new category will appear selected in the category list, and no descriptors will be shown.
4. You can now create the descriptors you wish to be part of this category.

Using Constellations: Creating Constellations

Creating an Empty Constellation

1. To create a new, empty constellation, select "New Constellation" from the "Entry" menu.
2. This will open a blank constellation window. You can fill in the name and layer this Constellation in the same way as you would a star or a note.
3. If you want this constellation to be primary entry point into your research, check the "Entry Point" check box.

Building a Constellation from Found Entries

1. One way you may want to go about building a constellation is to search through the database for entries with common themes and place them in a constellation.
2. You can do this by conducting your search, and then dragging the items you want to be part of the constellation into the constellation's item list window.
3. If there is an entry list you wish to turn into a constellation, make that window the front most. Then select "Make Constellation" from the "Entry Menu" This will create a new constellation with all of the items in the entry list (except for notes) in the constellation's item list.

Building a "Conceptual Constellation"

1. You might wish to build a Constellation without any real data in it, perhaps to use as a template or play with conceptual maps.
2. Make a new constellation.
3. You can add new blank stars and constellations by clicking the "Add New Star" and "Add New Constellation" buttons in the item list toolbar.
4. These will add new items to your list. If you do not want to fill in the actual information, you can name them in the entry list window as you would finder files.

Building a Constellation Directly from Files

1. You might wish to build a Constellation without immediately layering the data.
2. Make a new constellation.
3. You can create stars by dragging files from the finder into the constellation's item list.
4. These will add these files as stars to the item list. The star's names will be the file names by default, but you can edit their names as you would finder files.