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Place and space as shapers of disciplinary identity: The role of indexicality in the emergence of disciplinary writing expertise

Today, researchers and practitioners in the fields of English for Academic Purposes (EAP), English for Specific Purposes (ESP), and first and second language writing research overwhelmingly acknowledge that knowledge about just discoursal forms and disciplinary genres is not enough for students to become proficient in their disciplines (Beaufort 1999; Ivanič 1998; Prior 1998; Swales 2004; Tardy 2009).

Even so, many studies continue to focus on surface-level analyses, limited either to the text that is explicitly identifiable on the page, or to describing the context *alongside* the text. As discussed by Lillis (2008), and Starfield (2011), many such studies examine context as though it were "talk around text" (Lillis 2008). By positioning their research from the outside looking in, researchers are methodologically comforted in maintaining a more narrow and limited understanding of the nature of social context by adopting methods which on the surface seem to 'get at' social context, but in truth remain on the 'outside' of meaning. Such studies fail to bridge the gap between text and context, by not examining more closely "how discourse and text 'index' social structure" (Starfield 2011: 176).

The purpose of this chapter is to explore how indexes bridge the gap between a discipline's visible genres and its embodied knowledge and practices. Disciplinary newcomers are only able to participate fully in a discipline's activities by gaining access to *all* aspects of practice via its indexical system. To become proficient writers and participants in their discipline, students must thus learn about its indexes, in addition to the overt discoursal and linguistic patterns typically taught in the ESP/EAP and L2 writing classroom.

After describing the methodologies that have been used to investigate these issues, this chapter then describes how place and space are historically central to the discipline of geology whose physical locus of study is 'the field'. It then describes the emergence of a rhetoric of field description, and suggests how concerns historically related to fieldwork have patternized as shared cognitive frames of practice. Such shared frames are embodied within the disciplinary practitioner's identity. The chapter then suggests how shared cognitive frames 'materialize' as visible genres via indexicality. The chapter concludes with a case study of the disciplinary becoming of a field geologist, observed as he moved from undergraduate in geology to experienced instructor in geology (1996-2008). From this period, we will examine the emergence of disciplinary indexicality in his communications about the field, as well as embodied references to geological place and space.

Methods

To examine indexicality in the ways described above, this research has combined quantitative and qualitative methods, drawing on the rich traditions of EAP and ESP-based genre research, academic literacy, the New Rhetoric, and composition and rhetoric writing research.[1] It is essentially ethnographic in outlook, in the sense that as a 'situated analysis', it has attempted to devise a more holistic view of indexicality in the workings of practice and disciplinary expertise. In order to identify and reveal hidden places where indexicality may be at work, it draws on a range of quantitative data, such as

- a genre-based study of published fieldwork reports (1992-2003)

1 Barton & Hamilton 1998; Bazerman 1988; Beaufort 1999; Berkenkotter & Huckin 1995; Devitt 2004; Freedman & Medway 1994; Hyland 2000; Ivanič 1998; Lillis & Curry 2010; Myers 1990; Prior 1998; Starfield 2011; Street 1997; Swales 2004; Tardy 2009.

- standard deviation analysis to measure shifts in the use of indexicality over time (Dressen-Hammouda 2012)
- a genre analysis of related artifacts (field notebooks, drawings, field reports, conference abstracts, dissertation chapters and course lecture notes)

It triangulates these findings with various qualitative analyses so as to gain more insight into the indexicality of practice:

- a sociohistorical analysis of fieldwork practices in geology (1650 to the present)
- participant-observations of disciplinary practices
- multiple interviews about disciplinary and writing practices, and about geology's history
- a reader-response study (Paul et al. 2001; Tardy & Matsuda 2009)
- narratives of disciplinary becoming: e.g., a longitudinal case study (8 years) of a field geologist, observed as he moves from undergraduate in geology to instructor in geology (1996-2008)

This study has thus been designed to develop a research perspective that is relatively "thick" (Geertz 1973), both in its description of disciplinary practice and in its researcher participation.

The next section lays the foundation for understanding how geology's system of indexicality emerged. Indexes, like other types of semiosis, always come from 'somewhere': they are always historically situated (Blommaert 2010; Silverstein 2003).

Place and space in geology: How 'the field' shaped disciplinary practice

A field geologist once described to me the importance of fieldwork for his discipline's practices and culture:

> From a psychological point of view, I'd say that if we stopped going out in the field entirely, I'm afraid we'd lose our soul. What makes geology *geology*, it's also, well of course you have to dust off the science a bit so that you don't stay stuck in the nineteenth century, but even so, there's a way of moving forward in our understanding of the Earth that depends on our culture, and in this culture, there's the *field*.

Place and space are an integral part of this interaction, because they situate practitioners within the sociohistorical context of their discipline. What today we call the science of geology thus emerged in response to a need to go out into *the field* to answer questions about humans' place in the world. Throughout 1600's Europe, an anthropocentric, Cartesian and theological view of the world predominated. Beliefs about the age of the Earth were largely influenced by theological doctrine, which situated the Earth's beginnings between 6,000 and 4,000 BC. However, naturalists from the late 1600s and early 1700s began to challenge both the idea of a young Earth as a result of the what were then "astonishing" observations they were making in the field. These observations eventually caused them to rethink their frames of interpretation and move toward a conception of time as absolute abyss, what geologists today call "deep time" (Dodick & Orion 2003; Dalrymple 1991).

Naturalists sought *rational* explanations for the Earth's age, which they believed could only be gained through actual observation in the field. By the mid-1700s, naturalists had come to regard the Earth's strata as an "archive of nature" or a "history of the Earth" (Gohau 1987). By calculating a decline in sea-levels, for example, by the 1750's some naturalists were already proposing a time span of some 2 million years. Within the next fifty years, this time span increased exponentially. In effect, by this time many amateur naturalists were carrying out their own relatively simple observations, such as measuring the rate of erosion of basalt flows by river beds. Due to the widespread circulation of publications (Ellenberger 1988) by the early 1800's, naturalists shared a general belief that the maximum thickness of the Earth's strata was a rough estimation of time, and that the age of the Earth was not just a couple, but hundreds

of millions of years.[2]

Despite this shared understanding of geological time, at the start of the 1800's there were still no formal institutions for training geologists. Instead, future geologists learned field competence by picking up a subtle and largely tacit body of rules through unsupervised, practical experience in the field. Using standardized memoirs (commonplace by 1820) and published mapping (Cuvier & Brongniart 1811; Smith 1800-1815), interested amateurs could learn how to carry out a good field study. Starting with simple structures and good exposures, and comparing their own field observations to earlier works, amateur geologists could learn, on their own, how to then recognize more difficult structures. These were "self-made geologists" who forged their own understanding of natural facts through relentless travel and communing with the rugged outdoors: a 'real' geologist would think nothing of walking 50 miles just to have a look at an outcrop (Rudwick 1985). The field thus became the only place geologists could truly learn to observe natural facts, develop their spatial and visual eye and eventually gain field competence recognition from the community of practicing geologists.

It is significant that the quest for field competence recognition coincided with the needs of heavy industry, and its dependence on coal. Up to the early 1800's, coal had been relatively easy to find. However, newer sources lay below the well- known strata in a maze of chaotic formations. With increasing competence, geologists were able to interpret such geological formations. By using coastal cliffs or quarry exposures, they would map local sequences of strata, which they later combined with strata from other locations, giving them a good idea of where to predict the presence of coal and other minerals.

Emergence of a rhetoric of field description

Because of their growing ability to infer the location of coal deposits, and the potential gains of working for industry, geologists began to

2 The age of the Earth was ultimately determined to be 4.6 billion years (Dalrymple 1991).

rival one another for recognition of their skills. To gain this recognition, however, they needed to 'prove' their field competence to other practicing geologists through field description and argumentation. Demonstrating field competence required not only demonstrating relevant frames of seeing and interpretation, but also a skillful wielding of natural facts through rhetoric. Although Rudwick (1985) describes the period's scientific paper as being largely devoid of argumentation and dissention, he observes that specialists were able to 'read between the lines' thanks to extensive letter writing and public paper readings.

The case of letter writing is extremely interesting because the rhetorical strategies used to persuade and argue with peers at that time are very similar to those still used to describe the field in the modern research paper. Some of these strategies can be seen in the following letter, written by English geologist Thomas De la Beche to a colleague about how negatively two rival English geologists (Murchison and Lyell) had reacted upon learning about his unexpected discovery of fossil plants in new strata rather than in the coal measures, which is where they had been found up to that point:

> Murchison and Lyell, ***who confessedly never saw a square yard*** of the country, attacked me most fiercely, particularly the latter, declaring their perfect conviction that I had made a gross mistake as to the geological position of the beds whence the plants were derived, &c. &c. &c. ***Now as I had toiled day after day, for months in the district, examining every hole and cranny in it***, this was a pretty good go of preconceived opinions against ***facts, which are so plain that the merest infant in geology could make no mistake***. […] (T. De la Beche, cited in Rudwick 1985: 103-106, emphasis added).

The arguments advanced here similarly form the basis to the modern field geologist's quest for competence recognition: having been in the field is the necessary precondition to making any valid statement of observational fact. Thus, if a geologist has never set foot in the region under question, the weight of his argument is substantially diminished because he must be able to *see* in order to *interpret*. Not only had De la Beche's rival geologists never actually seen the area for themselves, they were seriously questioning his competence without foundation. It

was, however, precisely because De la Beche had been in the field, spending days and months "toiling, examining every hole and cranny", that he was able to make what was ultimately a paradigm shifting observation, later accepted by the scientific community as a whole.

In a historical overview of the emergence of a rhetoric of field description, we can thus pinpoint the following abilities as being important for field geologists, even today: having been in the field and proving it; being able to see and interpret correctly; knowing how to 'do the work' of the field geologist; and choosing the most relevant field facts. In the following sections, it will be argued that such historically situated concerns serve as the foundation for today's indexical practices.

Theoretical crossroads: A joining of identity, frame and genre

To this point, however, we are not yet in a position to demonstrate how place and space construct disciplinary practice, nor to bridge the gap between text and context. Nor can we answer other important questions, like how newcomers to a community of practice gradually learn to master the various complexities of the community's genres and become competent or expert performers.

In an earlier attempt to answer to these questions (Dressen-Hammouda 2008), I drew on and blended three different theories (identity, frame, and genre) to create a framework to describe what practitioners-in-the-making would need to embody and learn, in addition to textual genres, before being able to converse fluently using a rhetoric of field description.

The first of these, Bourdieu's (1984) *habitus*, informs us that one's social, and by extension disciplinary, identity arises from *habitus*, which causes us to unconsciously embody the patterns, norms and regularities that structure a particular social milieu: its behavioral

codes, habits, bodily attitudes and ways of talking. The term embodiment implies that the social structures and norms reflected in *habitus* are learned by the body.

Lakoff and Johnson (1999) have argued convincingly that we are *obligated* to use our bodies to create and recreate internalized social structures simply because the sensorimotor structure of our brains forces us to identify the patterns and regularities of our environments. As we are exposed to these patterns and norms, we assimilate them as largely unconscious structures in our sensorimotor system and later perform them using our bodies: talking, doing, thinking and behaving. On the one hand, the bodily performance of these embodied patterns serves to anchor us as increasingly belonging to particular communities of practice. On the other, as we perform these structures, our performance becomes increasingly recognized as legitimate (see Lave & Wenger 1991).

The second theory is related to the first. The embodied patterns that organize our knowledge about the world are frequently described by linguists as *frames*, or cognitive knowledge structures that capture what is typical about the world (Minsky 1975). Today, frame is generally used among linguists to explain the *non*-linguistic processes by which individuals cognitively organize the world.

Frame has particular relevance for the embodied structures of *habitus*. Indeed, linguistic descriptions of frame (Fillmore 1985; Stubbs 2001; Tannen 1993; Tannen & Wallet 1993) closely overlap with that of *habitus.* Like the structures of *habitus*, frames are not seen as being innately present in the individual, but are acquired through socialization. Like *habitus*, frames are constructed out of cultural and social experience and are both diachronic and culturally dependent. Once established, frames, like *habitus*, are relatively stable, with some features being more stable than others. Furthermore, like *habitus,* the construction of a frame is a process that occurs largely beyond our conscious control and is therefore inscribed in the knowledge of the body. Frames describe how and why we recognize recurrent patterns in our social environments and later perform those patterns to make relevant meaning. Therefore, *habitus*, as social or disciplinary identity, can be described as an ensemble of *specialized embodied frames* specific to people's specialized communities of practice. The

frames of *habitus* drawn from the milieu shape people's ways of seeing, thinking, believing, doing and communicating in common.

The third related theory deals with genre. It is revealing that genre scholars today treat genres as a sort of frame:

> Genres are not just forms. Genres are forms of life, ways of being. ***They are frames for social action.*** They are environments for learning. They are locations within which meaning is constructed. Genres shape the thoughts we form and the communications by which we interact. Genres are the familiar places we go to create intelligible communication action with each other and the guideposts we use to explore the familiar. (Bazerman 1997: 19, emphasis added)

As a cognitive frame, a genre does not ensure that a typified, communicative act carried out, but provides the potential for doing so. Other similarities between frames and genres are underscored in the literature, as discussed in Dressen-Hammouda (2008). For example, they are both *socially situated*, emerging as a shared response to the exigencies of a group interaction; they are both *typified recognizable patterns* as a result of individuals proposing consistent responses to recurrent situations; they are both *relatively stable yet only momentarily so*. Both can be modified — however slowly — in response to changing needs and perceptions; they are *transmitted* by competent users to newcomers who thus learn socially relevant ways of organizing experience; they both provide for *cognitive efficiency* by translating the relevant elements of shared experience into discernible structures; and they are both *meaningless in isolation* from their semiotic chain. It is the properties of the chain that give meaning to frames and genres. A whole range of semiotic resources (e.g., visual, gesture, behavior, text discourse, frame) must therefore be juxtaposed in order for communicative interactions to become dense with specialist meaning.

The act of making social meaning is thus distributed simultaneously across verbal, perceptual, gestural and other semiotic modes. The expression of one semiotic form, such as a genre of text, closely depends on the simultaneous elaboration of other shared semiotic resources. The strong association between genres and the embodied frames of disciplinary identity strongly underscores their

co-occurrence within a semiotic 'chain' (e.g., Bazerman 1994; Räisänen 2002; Swales 2004). In this regard, to demonstrate genre mastery students must learn to draw not only on the relevant *textual* genre chain(s) of their community's written practices, but also the *entire chain of shared semiotic resources* in which their common experiences have patternized as embodied frames (Figure 1).

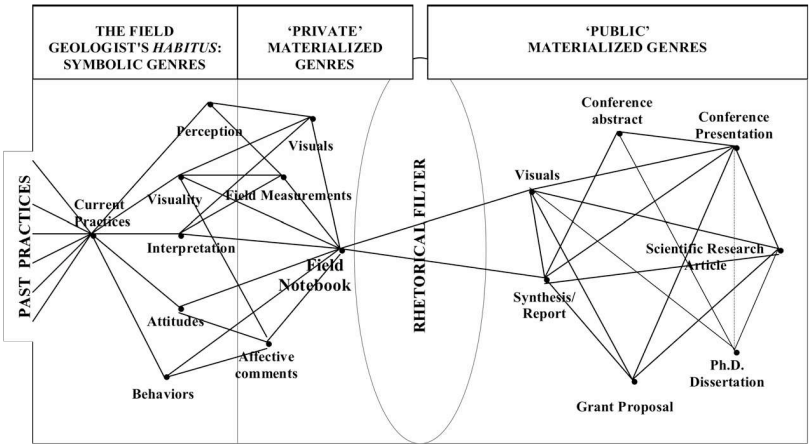


Figure 1. A chain of semiotic resources for fieldwork practice

Figure 1 suggests how genres, frames and *habitus* link together within a chain of semiotic resources for doing and talking about a geological field study. On the left side of Figure 1 are a number of "symbolic" genres, or cognitive frames embodied in *habitus*: these are field geologists' embodied frames for seeing (visuality), for interpreting, for being (attitudes), and for doing (behaviors) in common.

The symbolic genres feed into and structure the 'materialized', or visible, genres of field practice. Some of the materialized genres are 'private', in the sense that they are not meant to be shared directly. Such private, materialized genres are often void of meaning for anyone but the writer, but can still be recognized as genres because they constitute:

> recognizable responses to the problematics and opportunities (the

> "exigencies") of a shared situation [because they] contribute to the building and sustaining of shared communal identities (Medway 2002: 125).

Such genres possess what Peter Medway has called "a rhetoric of texts without readers" (2002: 143). Although the genres remain within the domain of the writer's private use, they are nevertheless *indirectly* rhetorical because their content is always composed with an eye both to past community frames of reference as well as to future communications: oral, written, and visual. In this sense, such genres are construed with the purpose of later reproducing more public disciplinary genres to communicate their results with competent genre performers.

The field notebook is one such private genre for field geologists. It, in turn, consists of a number of other genres, such as standardized visuals, maps and other conventionalized field drawings, field measurements, and 'affective' comments about work conditions (e.g., "It rained today; icy downpour") which are later used to jog the geologist's visual memory of the site observation ("Oh, that was the place we had the icy downpour"). These private genres, as "texts without readers", in turn feed into and build the public genres field geologists use to communicate their findings to one another: standardized visuals, the field report published in the scientific research article and other public genre forms: grant proposals, conference abstracts and presentations, etc.

In this regard, the specialized semiotic frames people embody as part of their disciplinary identity, or *habitus*, represent much more than just the 'context' that exists *alongside* a community's genres. People carry around with them and continually recreate this context by performing their embodied frames and rendering them visible to others.

‘Rendering visible’: Indexicality as nexus

Although context clearly does not just exist ‘alongside’ recognizable genres, an explanation for transforming shared mental structures into recognizable, materialized genres is still needed. Relatively recent discussions in the literature point to how indexicality effectively acts as the nexus for this process.

The understanding of indexicality that I espouse combines the more structuralist approach underlying linguistic anthropology (Ahearn 2001; Bucholtz & Hall 2005; Duranti 2003; Ochs 1992; Silverstein 2003) with the inspiration of ethnomethodology: Garfinkel’s (1967) indexicality has motivated other uses of the concept, including by de Luze (1997) and Blommaert (2010).

For Bucholtz and Hall (2005: 594), an index

> In its most basic sense … is a linguistic form that depends on the interactional context for its meaning […]. More generally, however, the concept of indexicality involves the creation of semiotic links between linguistic forms and social meanings.

The function of indexicality is to elicit the activation of specific semiotic associations, or inferential structures, within the genre chain by means of specific linguistic forms in the text. Knowledgeable insiders glean relevant meaning from linguistic form when recognition of the associated semiotic resources they share is activated, but without what is being ‘communicated’ necessarily appearing explicitly. De Luze (1997) highlights its importance for all communication and meaning making, noting that indexicality

> affects not only the whole of discourse (oral, visual, behavioral) but all things unformulated that surround it: its present, its past, its future. Without a doubt, we must admit that indexicality is one of the most formidable challenges posed to our understanding of communication and its interpretation to have ever been proposed (1997: 48).

Blommaert (2010) further develops the theory of indexicality by underscoring its *systematic patternization*:

> Indexicality, even though largely operating at the implicit level of linguistic/semiotic structuring, is not unstructured but *ordered*. It is ordered in two ways, and these forms of indexical order account for 'normativity' in semiosis. The first kind of order is what Silverstein (2003) called 'indexical order': the fact that indexical meanings occur in patterns offering perceptions of similarity and stability that can be perceived as 'types' of semiotic practise with predictable (presupposable/entailing) directions. […] Indexical order of this sort is a positive force, it produces social categories, recognizable semiotic emblems for groups and individuals, a more or less coherent semiotic habitat. (Blommaert 2010: 37-38)

Hence, indexes are structurating forces: they are simultaneously identifiable linguistic form and associated normalized semiotic meaning. As such, they are the *nexus*, or articulative bond, between the visible regularities observable in materialized visual, behavioral, textual and discoursal genres, and the shared symbolic genres that organize social cognition and practice. Indexes do not exist 'outside' of the individuals who reproduce them, but are intimately integrated within them as the structurating forces of situated cognitive reasoning: people effectively imagine or perceive indexical meaning based on their experience with relevant symbolic genres. As thus argued by de Luze (1997), following Garfinkel (1967), indexes do not interfere with meaning; they are the basis for it. In other words, it is indexicality which allows for the symbolic genres that structure collective disciplinary practice to materialize as shared meaning through recognizable genres.

Indexicality in geological fieldwork practice

I willbegin the discussion of indexicality in geology fieldwork practice by describing the results of a situated genre analysis of a corpus of 140 research articles in field geology (1992-2003). The analysis revealed 13 variables that 'index' the historically situated concerns of geological field practice, described in a preceding section. I was able to identify these indexes as a result of a long-term participant observation with field geologists, which allowed me to go

on numerous field trips with them and listen in on their various conversations about their work, thereby gaining insight about what sorts of concerns geologists might put in their published writing.

Some of the indexes draw explicit attention to the author of the text ('personalization cues'), while others draw attention to the geologist's research actions carried out in the field ('doing-the-work cues'). Others still reveal the disciplinary situatedness of field practice ('disciplinary cues'), as exemplified in Table 1:[3]

Table 1. 13 variables that index geological field practice

Personalization cues	
1. First-person pronouns and possessive adjectives	(1) The estimated thickness of the Cretaceous from its upper contact with the Claron to the base of the sequence in which ***we investigated*** structures is about 570 m.
2. Evaluative adjectives and adverbs	(2) ***Unequivocal*** field relations show that B2N and B3N microgabbros form ***thin*** margins […]
3. Interpretive comments	(3) Unequivocal field relations show that B2N and B3N microgabbros form thin margins to B2 and B3 sheets, respectively, and occur as xenoliths within them, ***so it is impossible for them to have intruded along the basal contact after formation*** of the thin marginal zone.
Doing-the-work cues	
4. Nominal/verbal markers of research activity	(4) More ***information is obtained from samples*** from the eastern part of the stock because the magma apparently ascended to a higher level and thus these traverses were made into a deeper part of the stock.
5. Metric, angle or direction measures	(5) Orientations of the axis […] reveal a stringing fan-like pattern (fig 9) trending ***south southwest 215° in the west to southeast 125° in the eastern part*** of the ***study area***.
6. Locational adverbs and prepositions	(6) The exposure is a landslip lying ***close to*** the SE flank of the phonolitic dome of Chabrières. ***Further down***, the ***out***crop ***extends more than 1 km along***

3 These variables have also been described in Dressen-Hammouda (2008, 2012).

	the Saliouse stream.
7. References to visual data	(7) [It] can be traced northward to where it marks the eastern termination of the north verging Pine Hill and the western termination of the south verging Elbow thrust (***Fig. 3***).
8. Location of the fieldwork	(8) […] the location is likely ***near sample 94MR355*** (***Figure 1***), as granites intruding basic rocks are only mapped and observed ***along the road in this area***.
9. Self-citation	(9) (self-citation of one's own prior field studies)
Disciplinarity cues	
10. Nominal or adjectival field descriptors	(10) The blocks consist of: (1) local basement rocks (Hercynian granites and metamorphic rocks); (2) lava clasts (basalts, trachytes and phonolites) (3) various coarse-grained rocks displaying cumulate textures; (4) various pyroclastic fragments with more or less diffuse boundaries [...]
11. References to geological time	(11) Further downship along the thrust moderately dipping Cretaceous strata in the hanging wall rest in thrust fault contact on upturned Eocene and Cretaceous beds.
12. Verbal adjectives and participles	(12) […] the critical zone postdated the completion of the Steelpoort pericline, because the steeply dipping western limb of the structure is onlapped by gently dipping cumulates that overlie the lower chromitite layers south of Steelpoort .
13. Citations of others' fieldwork	(13) As Suppe (1985) emphasizes such folds can lock […]

The way these variables are interwoven throughout a field geologist's published research article creates a 'behind the lines' demonstration that the writer is a 'legitimate' (Lave & Wenger 1991) member of the research community. They serve as proof that the writer has physically been in the field, and also show s/he has acquired the ability to see and interpret like a field geologist, 'do the work' and carry out the research tasks of the field geologist, and choose the most relevant field facts that correspond to currently accepted frames of interpretation. The rhetorical effect of these indexes on trained field geologists has been studied and described in an unpublished, small-scale reader response study with five practicing field geologists

(Dressen-Hammouda 2013). The field geologists consulted in the study all confirmed their sensitivity to the indexes described in Table 1, in ways which echo the links proposed in Table 2.

Table 2. How a writer's symbolic genres materialize for other experienced practitioners

Historically shared concerns	**Symbolic genres**	**Indexical Cues**	**Examples**
Demonstrating the ability to see like a geologist	Seeing and visuality	(2) Evaluative adjectives and adverbs	superb, thin, gently
		(6) Locational adverbs and prepositions	along, further down, close to
		(7) References to own visual data	(Fig. 3)
		(10) Nom./Adj. field descriptors	lava clasts, basalts, pyroclastic
		(12) Verbal relations	dipping, trending
Demonstrating an ability to - think like a geologist - use appropriate frames of interpretation	Interpretation	(2) Evaluative adjectives and adverbs	superb, unequivocal, ideal
		(3) Interpretative comments	[field description] + so it is impossible for them to
		(4) Nominal and verbal markers of fieldwork	More information is obtained from samples
		(7) References to own visual data	(Fig. 5)
		(9) Citations of self and others	
		(10) Nom./Adj. field descriptors	lava clasts, basalts, pyroclastic
		(11) References to geological time	upturned Eocene and Cretaceous beds
Proving authen-ticity as a field geologist by showing that - one does one's	Being and attitudes	(1) 1st-person pronouns and possessive adjectives	We investigated Our samples show
		(2) Evaluative	superb, unequivocal,

own fieldwork - one is a 'real' field geologist		adjectives & adverbs (3) Interpretative comments (4-9) All doing-the-work cues	ideal, gently No where else is there... (Table 1)
Demonstrating field training and showing an ability to - act and think like a field geologist - reframe observations within current ways of knowing - 'sell' one's ideas	Doing and practices	(2) Evaluative adjectives and adverbs (4-9) All doing-the-work cues (10-13) All disciplinarity cues	superb, unequivocal, ideal, gently (Table 1) (Table 1)

Learning indexicality by rendering practice *visible*

This final section examines how indexes, such as those identified for field geology's scientific writing, gradually emerge in a writer's written discourse in conjunction with that individual's increasing participation in his community of practice (Lave & Wenger 1991). In effect, examining how people learn relevant indexicality is a significant focus of study because as Blommaert (2010: 38) has pointed out, while indexical order is *positive normativity*, usefully "produc[ing] social categories, recognizable semiotic emblems for groups and individuals," it also has a more pernicious nature tied to social power. He thus equates indexicality with Foucault's (1981) 'order of discourse' because it is also involved in maintaining social authority, control and evaluation:

> Indexicalities operate within large stratified complexes in which some forms of semiosis are systematically perceived as valuable, others as less valuable and some are not taken into account all, while all are subject to rules of access and regulations. […] such systemic patterns of indexicality are also

> systemic patterns of authority, of control and evaluation, and hence of inclusion and exclusion *by real or perceived others*. This also means that every register is susceptible to a politics of access. (Blommaert 2010: 38)

Learning correct indexical patterns is impeded when access to those patterns is not made explicitly available, either because access entails access to power (e.g., Blommaert 2010; Ivanič 1998; Starfield 2011; Street 1997; Tardy 2009) or because it is exceedingly difficult to make those structures explicit for teaching and learning purposes (Kellogg 2008; Schriver 1992).

Cleary, having access to indexical meaning is a key aspect of successful social interaction and socialization.[4] The only way for individuals to gain access is for those patterns to become 'visible'. If indexical patterns do not become visible, legitimate performance cannot emerge (Lave & Wenger 1991). In their examination of apprenticeships in West Africa, for example, Lave and Wenger (1991) observed how novice tailors successfully carried out a number of small tasks which revealed their understanding of the relationship between the whole design project and the individual pieces of cloth used to create it. In comparison, the novice butchers they observed were unable to perform the work of more skilled workers. The researchers deduced that this was because the novices' learning was blocked by the physical layout of the workplace. Unlike the novice tailors, they were unable to 'see' the work practices they were supposed to be learning.

Visibility, or the performance of relevant indexes, becomes possible only when novices can actually observe the *entire process of creating* the work, not just its end product (e.g., a text). Learning indexicality and becoming a disciplinary practitioner requires gaining access to the *whole range of semiotic resources* experienced practitioners use to fully reconstruct situated meaning (e.g., Figure 1), and by watching and observing how experienced practitioners manage

4 Acess to and performance of indexical meaning has been studied within a number of research traditions: Blommaerts 2010, Goodwin 2000, Hindmarsh & Heath 2000, Lave & Wenger 1991, Lillis & Curry 2010, Pecorari 2006, Roth 2004, Silverstein 2003.

and reproduce their practices, motivations, knowledge, unspoken assumptions and anticipation of reception.

The following sections illustrate the case study of a successful apprenticeship into the community of field geologists. The excerpts below constitute a narrative of disciplinary becoming over a period of eight years (1996-2008). This narrative is drawn from a series of written and visual documents (field reports written for class field trips, doctoral field notebook, visual sketches, standardized visuals, scientific publications, and conference abstracts). The analysis of these documents was further complemented by a large number of text-based retrospective interviews with the author over a period of several years (2000-2008).

Writing about the field as a third-year geology undergraduate (1996)

The first text is an excerpt from an early field report the author wrote as a third-year undergraduate in geology at a French university. As his first real effort to write a field report, we will see that it is still far from what an experienced field geologist would write. 'Personalization cues' are shown italic-bold, and 'doing-the-work cues' are shown in underlined italics.

> The Montagne Noire, southern prolongation of the French Massif Central, and the Cap Creus peninsula, extension of the Alberes crystalline massif into Spanish territory, are two fragments from the Hercynian ridge. In both cases, the terrains are old, having formed during the Carboniferous era. *The field trip* ***allowed us*** *to study* the region's deep tectonics. *Using* the poles from the stratification planes, ***we trace*** a large circle onto the Schmidt net (cf. page 5). The polarity from the Schmidt net gives ***us*** the fold axis 'x' ***(****N40–NE6*). By *using* the poles from the schistosity planes, ***we determine*** a mean pole (◊) with which ***we trace*** the medial schistosity plane (*N44–NW34*). ***We note that*** there is a ***slight variation*** in schistosity direction *in* the two limbs, which *indicates* to ***us*** a fan-shaped schistosity. The Schmidt net *allows* ***us*** to ***conclude*** that the schistosity plane *passes through* the fold axis. Remark : the *presence* of microfolds *in* a ***thin*** layer *gives* ***us*** *the same information*, i.e., that the axial plane is *parallel to* the schistosity.

While a number expected cues are present, the frequency and ways in which the author uses them as an undergraduate is very different from a publishable scientific account. For example, he uses very few disciplinarity cues (nominal or adjectival field descriptors, references to geological time, participles, references to fieldwork) although they are the cornerstone of the field report. Moreover, his use of the cues lacks precision. A more experienced writer would not write 'terrain' or 'old', but would instead qualify the concepts with more detail, e.g., simply stating what kind of terrain or what age it is. In addition, although his field report contains a number of visuals, he never refers to them in his text, which is typical of student writers learning to integrate verbal and visual data. Finally, what is striking is his significant use of personalization cues, which essentially make him the primary grammatical agent of his field account. This is something which experienced field writers no longer do — at least, not since the early 1900's — instead allowing their observations to 'emerge' from field details.

The indexical cues in this writing sample would thus appear to have their own purpose, serving not to highlight this writer's research status, but to demonstrate that he has done his homework correctly. His use of first person pronouns draws the reader's attention not to his results, but to his actions. He tells about what he *did*, rather than describe a natural reality. As he explained in a final interview (2008), he realized in retrospect how far he actually had been from being a real field geologist:

> This particular field trip is interesting because I later went back to the site as an instructor, and I've corrected a number of field reports on this same site from students I've advised. After a rather difficult first experience as a student, I came to really appreciate the site's true value several years later as an instructor. The main reason was that over time, I gained more experience and a greater ability to reflect back on the significance of the site's geology. As a student, I didn't even understand the exercises the teachers gave us! But when I crossed over to the other side, everything seemed clearer to me. It also made me realize that I hadn't actually understood much at all when I was an undergrad.

We can compare this early work to the disciplinary genres he produced a few years later, such as the class notes he wrote and now uses when he takes his students back to this same site. Although his class notes are an instance of an in-between genre (despite his best intentions, he never quite had the time to work up a publication on this particular site), they nonetheless provides a glimpse into his mastery of field geology's indexical system. Because the purpose of this genre is to provide important background knowledge to budding geologists, rather than to convince the community of peers of the validity of his interpretations, there are fewer personalization cues than would be typical for a published account. Also, there is no need to situate himself explicitly in the field and convince his audience; rather he attempts to outline the relationships between the significant features of the field, and relies heavily on disciplinarity cues (nouns and adjectives to describe structures, references to geological time, verbal participles) to help build his students' frames of interpretation. Once again, personalization cues are shown in bold italics, and doing-the-work cues are shown in underlined italics.

> Geological context: Cap Creus —> NE Spain, eastern extension of the Pyrenean axial zone
> Lithologies: sedimentary rocks of Precambrian —> Cambro. Ordovician age
> Magmatism: emplacement of 2 grandiorite intrusive massifs (*Rodas* and *Rosas*) *in* the metasediments of ***lower*** lineation; leucogranites and pegmatite *are present in* migmatite *as seen in* the high grade zone and ***more particularly*** *in* the high-strain zones.
> Structures: polyphase structures *in* high deformation zones.
> Tectonic interpretation: D2 and D3 ***continuous*** through time with 1 ***progressive*** passage from a transpressional regime during which ***pure*** shearing dominates D2 event and then ***simple*** shearing during D3. D2 deformation in transpressive context continuous late to post-meta conditions (D3) with 1 *localisation* of the deformation *along* ***narrow*** mylonitic zones. D3 is ***clearly*** late to post —> isograde deformation of sill + D3 affects *Rosas* grandiorite emplaced *at peak*.

While this text acts as a sort of 'end point' for his disciplinary becoming, it would be interesting to examine a few key points during his journey into his community of practice. During this journey, the community's practices became sufficiently visible for him to master its system of indexicality, defend his dissertation, later be hired as an

associate professor in geology, and then transmit this knowledge and render it visible to other newcomers to the discipline.

Writing about the field as a first-year doctoral student (August 1999)

In August 1999, he spent the month in northern Madagascar with his PhD advisor carrying out a major field study for his doctoral degree. Early on in the field campaign (Day 4), he discovered a number of outcrops he described in his field notebook (Figure 2).

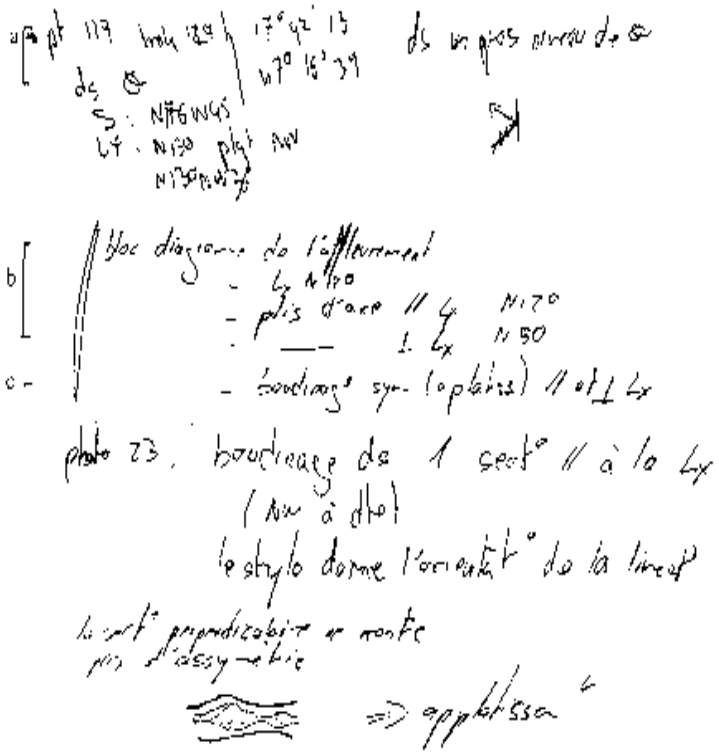


Figure 2. *Excerpt from the field notebook. Outcrop 129 (August 1999)*

In a "large bed of gabbro" ('*gros niveau de gabbro*', Figure 2a), he discovered an outcrop with many folds. In his notebook, he noted down the outcrop's lineation (north 120) as well as the orientation of the different folds, at one point parallel (N120) to the lineation and at another perpendicular (N50) to the lineation (Figure 2b). In addition, he observed some *double boudinage*, indicated in his notebook as "boudinage syn aplatissement" (Figure 2c) parallel and perpendicular to the outcrop's lineation.

That evening, he attempted to understand what he had seen earlier in the day by working his observations from outcrop 129 (Figure 2) into a rough "block diagram" (Figure 3).

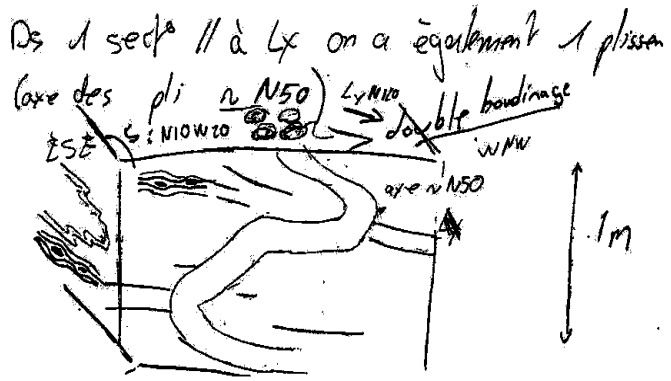


Figure 3. *First block-diagram, drawn in the field*

This first schema not only visually describes some of the more important folds he observed, but also represents his efforts to work out how everything fit together in three dimensions. Clearly, in order to produce such a visual, a researcher must truly understood what he has seen in the field. However, as this young doctoral student set to work that evening at his advisor's behest, he was anything but sure how the different structures actually fit together. He hesitantly and roughly sketched out his observations in a simple visual schema (Figure 3), which he reinforced with substantial textual support ('*In 1st section*

parallel to lineation, we also have 1 fold (fold axis about N50)'). As he explained in an interview (2001),

> Actually at first I didn't want to draw this block so I just drew a schema of one part of the outcrop (folded stratum with axis N50) and that's when I realized everything fit together, and I could see it all in 3D.

As a result of having sketched these different elements into a first visual schema, he realized he could actually conceptualize the region's geological structure. In addition, thanks to a discussion he had with his advisor that evening, he understood that their discovery at outcrop 129 was actually quite significant for understanding the regional geology. He then went on to draw a more refined block diagram several days later while still in the field (Figure 4).

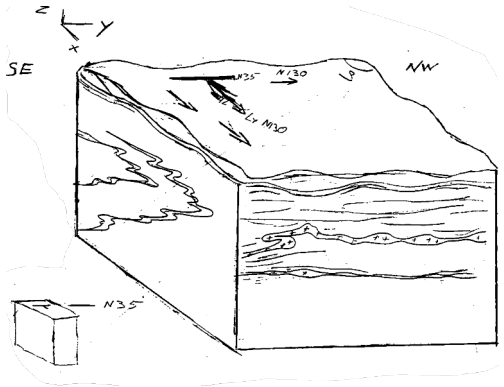


Figure 4. *Second block diagram (August 1999)*

The second block diagram (Figure 4) captures his field observations using a more subtle visual synthesis of his field results. In comparison to that first day he stumbled on outcrop 129 and grappled with how to understand what he was seeing, here he had already begun making a gradual shift from being a bewildered and inexperienced student to someone who took increasing control over his own interpretation by fitting what he'd understood into more a conventional visual form. The exercise, framed by ongoing discussions with his advisor and continued observations in the field,

was allowing for aspects of geological practice that had been hidden to him as an undergraduate, begin to be visible. He was understanding how seeing and interpreting fit together, and how to communicate about it.

Upon returning to the laboratory at the end of the field mission in September, he recrafted the communicative impact of the block diagram originally sketched in the field, further synthesizing his field data (Figure 5). What seems to be a homogenous set of visual data showing a chunk of the earth where everything is the same size, in fact reflects the 'smoothing over' of very heterogeneous measurements, ranging from 30 cm to 2–3 meters.

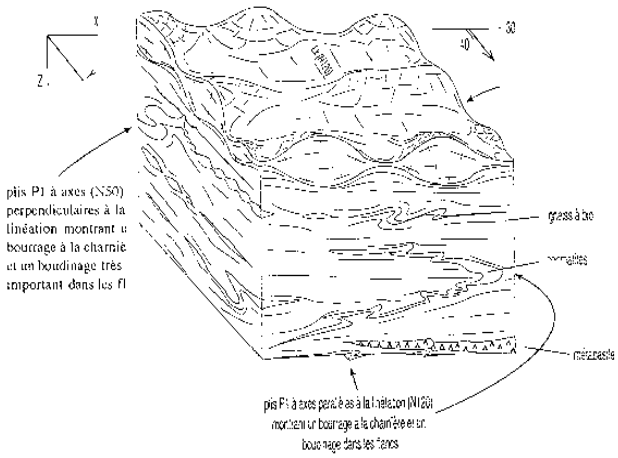


Figure 5. *Computerized version of the block diagram (September – October 1999)*

This visual interpretation is significant because it not only became the foundation for his later scientific communications about the results of his fieldwork mission, but also marks the rendering process whereby the indexical practices of his community were growing increasingly visible to him, and thereby in his way of talking about his fieldwork, as seen below.

Writing about the field as an advanced doctoral student (2001)

Two years after his fieldwork mission in Madagascar, the author had presented his results at a couple of conferences and submitted his field results to the scientific review, *Precambrian Research*. The article was accepted and published in 2003. In this newly recontextualized (Berkenkotter 2001; Bernstein 1990) version of his fieldwork, we once again find the block diagram.

In the end, we learn that many of the details of his field mission are given in the block diagram, which has *become* the field data thus making the 'textual' inclusion of such details superfluous, as the author explained in a later interview:

> There are things that stay because they're important, there's the Outcrop. The data remain the same, but the interpretation changes, a lot … but to have kept my block diagram like that, I don't know, I think it must be pretty rare. Often, what appears in the article comes after a long period of reflection, a synthesis of all the data, and it's only after that you begin to make synthetic schemas. What was good about this outcrop, was that it was extraordinary. It was very simply extraordinary. (Interview 2006)

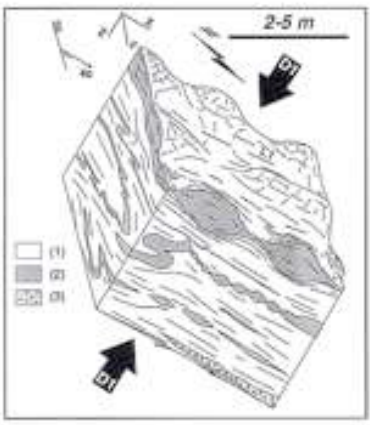


Fig. 5. Schematic block diagram showing the different types of structures related to the D1 event, at outcrop scale. In the YZ section: isoclinal folds with axes parallel to the L1 lineation; in the XZ section: boudinage structures associated with scarce folds perpendicular to the L1 lineation; in the XY section: chocolate-block boudinage surface with a lineation L1. All these structures are consistent with a vertical shortening. The actual orientation of the block diagram is related to the later D2 folding. (1) biotite gneiss; (2) pegmatite; (3) metabasite.

Figure 6. *The block diagram and caption, as published in 2003*

The following excerpt detailing his fieldwork comes from the 2003 article. While his earlier field writing lacked 'substance', here his field description is solidly constructed around a more conventional and specifically technical use of the part-genre's disciplinarity cues. Sentence numbers are indicated in brackets.

[1] The ***foliation*** in the Andriamena ***unit*** is a ***transposed composite plane*** mainly ***composed by parallelism*** of ***mafic quartzofeldspathic gneisses)*** and ***mafic-ultramafic bodies***.

The denser interweaving of disciplinarity cues allows him to demonstrate that he has mastered the specialized subject matter of his disciplinary community. He also has a more conventional use of personalization and doing-the-work cues, providing evidence for his credibility and support for his interpretations. Personalization cues are indicated with underlined italics and doing-the-work cues by bold italics in the sentences below.

[2] ***At the regional scale***, the foliation plane, ***denoted*** as S1, is *dominantly* ***oriented N160-N180 (Fig. 3a)*** and ***defines*** a ***kilometre-scale*** synform with a ***north-south*** axial ***trace (Fig. 4).***

[3] The S1 foliation is folded ***at*** *various* ***scales*** by post-schistosity folds F2 with a *steeply* dipping ***north-south*** axial plane and ***subhorizontal*** axis ***(Fig. 3b-stereo a, c, d and Fig. 4)***, *coherent with* an ***east-west horizontal*** shortening (D2).

[4] The D2 deformation is *heterogeneous* and ***shows*** a strain partitioning ***between*** *large low* strain zones ***(zones in light grey in Fig. 3a and Fig. 3b) limited by*** an anastomozed network of *high* strain zones *globally* oriented ***N160-N180*** with a ***width*** *up to* ***10 km (zones in dark grey in Fig. 3a and Fig. 3b)***.

[5] ***In*** the *low* strain zones, the S1 foliation as the mafic-ultramafic intrusions are *gently* folded by F2 ***kilometric*** *open* folds, *without any related* axial plane foliation ***(Fig. 3a-b and Fig. 4)***.

[7] Mafic-ultramafic intrusions ***located in*** these zones ***are characterized by*** *high* aspect ratios (10<H/L<40) *consistent with* a *strong* tectonic transposition ***in*** these zones ***(Fig. 3a)***.

[9] ***In*** the *low* strain zones, where the D2 strain is *moderate*, the L1 stretching lineation, ***marked by*** biotite or amphibole, ***defines*** a *regular* ***east-west*** trending ***perpendicular to*** the ***Andriamena*** basement contact with a pitch *around* ***90°*** and a *variable* plunging *due to* the F2 folding (***Fig. 3b-stereo a, b, c***).

To be recognized as a geologist with *expertise*, this author must not only demonstrate he can observe and describe the field, but must also credibly resituate what he sees by shaping it into a plausible interpretation. Using the field account's set of indexes, he begins to do this somewhat hesitantly in [11], where he situates his work's location (*near Brieville*) and describes a possible natural fact (*the L1 lineation seems to be replaced by a new L2 subhorizontal lineation*). While his claim is cautious here, as indicated by the modal *seems*, he backs it up with the timely use of field evidence: measurements, field relations and references to visuals, all supported by evaluatives to indicate that his field observations are credible:

[11] ***Near Brieville,*** where a transposition of S1 ***into*** a *new* S2 occurs, the L1 lineation ***seems*** to be replaced by a *new* L2 ***subhorizontal*** lineation *broadly* oriented ***N170 (Fig. 3b-stereo e)***.

He resolves his observational difficulties (*'seems to be replaced'*) in the following sentence, noting that structures supporting his interpretation *'can be observed more easily'* outside the first zone [12]. He then goes on to enumerate the structures in support of this interpretation [13]:

[12] Structures related to the D1 deformation ***can be observed*** *more easily* ***outside*** the high strain zones D2.

[13] ***At the outcrop scale,*** we observe numerous isoclinal intrafolial folds with a hinge ***parallel to*** the L1 lineation and a ***sub-horizontal*** axial plane ***(Fig. 3b-stereo a, b, c*** *and* ***Fig. 5)***.

In support of his interpretation, he uses a rare personalization strategy (*'we'*), lending particular weight to his observations, making them more 'real' and therefore authentic ([13] '*At outcrop scale, we observe numerous isoclinal intrafolial folds…'*). Given its rarity, its use draws more explicit attention to the researcher's field presence and ownership of observations. In stark contrast with his use of the device as an undergraduate, which showed that he was just trying to carry out the assigned exercises correctly, here his use of this overt personalization strategy is rhetorically persuasive in the construction

of his credibility. Its use becomes even more revealing when we consider that [13] and [14] also contain contested field details his advisors wanted him to do away with, including the block diagram. As he explained in an interview in 2001,

Author: I mean, as soon as you're in the field you draw something, and that it appears later in, in your publication, it's uh, I guess I put it in because I thought it was a good example, I even talked about it a bit with my dissertation advisors, and they were wondering, uh, what its real, interest, was if really it it added something… they were wondering if I shouldn't take it out, and then well finally I, I

Researcher: What sort of arguments did you use to keep it?

Author: To keep it? Well that, that it gave very good support to uh my, my description that I give in the text, you know? Otherwise I was going to give a description in the text without any visual support, and uh, well.

He explained that he had decided to include the original block diagram in the article because it "beautifully" represented the relative structural homogeneity found throughout the area. However, his explanation also seems to underscore an attachment he developed toward the block diagram and the personal effort it represented: the rendering of disciplinary visibility in his understanding of field geology, and the related use of indexes.

[14] The initially horizontal S1 foliation is also affected by ***boudinage structures*** compatible with the E-W stretching lineation direction ***(Fig. 5)***.

Interestingly, the field details described in [13] and [14], and his block diagram, become his *pièces de résistance* in the build-up toward his interpretation for the area, which he provides in the final sentence of the section, using an accumulation of personalization cues:

[15] ***All*** these structures ***suggest that*** the D1 event ***implies*** a ***significant amount*** of vertical shortening.

Like an experienced field geologist, he has thus learned to allow his fieldwork to speak for itself. He uses indexical cues to cause his interpretation to emerge from the constructed description of the field. However, the apparent ease with which he does this hides an intense

rhetorical effort expended to make his account appear as though it were the only reading possible.

At the same time, the presentation of his field data has become cryptic to outsiders, marked by its many conventional omissions. The reduction of his field observations in the research article is attributable to the particular frame of this new genre recontextualization, which requires the author to shape and rigorously substantiate his claims to fulfill the audience's expectations of establishing field competence.

Conclusions

Although indexicality has been gaining increased attention from EAP/ESP and L2 writing specialists (Lillis 2008, Starfield 2011, Dressen-Hammouda 2012), in my opinion, we are still only at the beginning of a new research phase that could provide meaningful, new tools to explore and exploit this potential. Clearly, indexicality is a powerful research focus that can be used to develop answers to central questions in EAP, ESP and L1/L2 writing research and pedagogy, such as how can we bridge the gap between text and context? How do newcomers to a community of practice gradually learn to master the various complexities of the community's genres and become competent performers? It seems to me that a study of indexicality can provide many interesting answers to such questions.

Cleary, space and place, as aspects of indexicality, are central to situated practice and the construction of disciplinary identity. Through ethnographies of disciplinary becoming, it may be possible to isolate aspects of the learning process of a discipline's indexical system that may be applied to learning situations in other disciplines. This in turn might help facilitate learning environments to allow for more effective teaching of disciplinary genres. It may also change our approach to teaching language entirely. Despite the real difficulties and challenges involved in putting such a program into place, both in terms of

research logistics and teaching practices, I believe that learners will truly benefit from our trying.

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