Wildfire Activities: New Patterns of Mobility and Learning

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ABSTRACT

The article argues for a historical perspective on mobility and learning. In social production or peer production, mobility takes the shape of expansive swarming, sideways transitions and boundary-crossing. The notion of wildfire activities is proposed to point out that activities such as birding, skateboarding, and disaster relief of the Red Cross have characteristics similar to those of peer production but predate internet and take place mainly outside the sphere of digital virtuality. Wildfire activities pop up in unexpected locations at unexpected times and expand very rapidly. They become extinguished from time to time, yet they reappear and flare up again. Learning in wildfire activities is learning by swarming that crosses boundaries and ties knots between actors. It is also learning by building mycorrhizae communities by means of cognitive trails and social bonds that make the terrains knowable and livable. The mechanism of stigmergy is foundational in mycorrhizae communities. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: Cognitive Trails; Mycorrhizae Communities; Social Production; Stigmergy; Swarming; Zone Of Proximal Development

INTRODUCTION

This article argues for a historical perspective on mobility and learning. In social production or peer production, mobility takes the shape of expansive swarming and multidirectional pulsation, with emphasis on sideways transitions and boundary-crossing. I will introduce the notion of wildfire activities to point out that activities such as for example birding, skateboarding, and disaster relief of the Red Cross have important characteristics similar to those of peer production but predate internet and take place mainly outside
the sphere of digital virtuality. I will discuss and use these three examples throughout the article. Few studies have been published on these three activities, even though each one of them represents a rich opportunity for gaining insight into the future of mobility and learning (existing studies include Law & Lynch, 1988 on birding; Beal, 1995, Borden, 2001, and Bäckström, 2005 on skateboarding; Majchrzak, Jarvenpaa & Hollingshead, 2007, and Palen, Hiltz & Liu, 2007 on disaster relief).

I will first historicize the notion of mobility, then move to describe characteristics of wildfire activities. After that, I will discuss the changing nature of communities, focusing on what I call ‘mycorrhizae’-like features of communities that emerge within and around wildfire activities. I will then sketch a conceptual framework for more detailed analyses of wildfire activities, based on the notions of cognitive trails and encounters. Finally, I will present six theses which together form a working hypothesis for understanding the new potentials of learning inherent in wildfire activities.

RECONCEPTUALIZING MOBILITY

As educators, we tend to define top down the desirable patterns of mobility we want our mobile learners to engage in. The risk is that these patterns do not touch what is going on in the lives of the learners - and the undercurrents of history.

As Kris Gutierrez and her colleagues point out, in all educational processes, there is the official script of the educator on the one hand, and the largely invisible counter-scripts of the learners on the other hand (Gutierrez, Rymes & Larson, 1995, Gutierrez, Baquedano-Lopez & Tejeda, 1999). These scripts frequently collide. But when they engage in dialogue and hybridize, we get powerful ‘third spaces’ of learning.

Extending Gutierrez’s analysis, we might talk about official mobility scripts and counter-scripts of mobility. An official mobility script would perhaps pre-prescribe fieldtrips to museums and other educationally valuable sites as the routes of mobility to be fostered by means of technologies such as mobile phones and digital cameras. A counter-script might depict mobility as a terrain of potential skateboarding spots in the vicinity. The two scripts have obvious structural differences. The official script determines a fixed endpoint of the movement – for example, a museum. The route from the school to the museum itself is rather irrelevant; thus, it should be effective and straightforward transport. For the counter-script, there is no endpoint. The terrain opens up to all directions for exploration. While a good skating spot is a delight, the movement between spots is equally if not more important since new spots are discovered only by moving around, by wayfaring with open eyes. The official mobility script resembles a pre-planned straight line
from point A to point B, whereas the counter-script resembles a tapestry of criss-crossing and winding lines which gain their shape as the action unfolds.

These two modes of movement correspond to Tim Ingold’s (2007) distinction between wayfaring and transport.

Wayfaring, I believe, is the most fundamental mode by which living beings, both human and non-human, inhabit the earth. By habitation, I do not mean taking one’s place in a world which has been prepared in advance for the populations that arrive to reside there. The inhabitant is rather one who participates from within in the very process of the world’s continual coming into being and who, in laying a trail of life, contributes to its weave and texture. These lines are typically winding and irregular, yet comprehensively entangled into a close-knit tissue. (...) They have no ultimate destination, no final point with which they are seeking to link up. (...) From time to time in the course of history, however, imperial powers have sought to occupy the inhabited world, throwing a network of connections across what appears, in their eyes, to be not a tissue of trails but a blank surface. These connections are lines of occupation. They facilitate the outward passage of personnel and equipment to sites of settlement and extraction, and the return of the riches drawn therefrom. Unlike paths formed through the practices of wayfaring, such lines are surveyed and built in advance of the traffic that comes to pass up and down them. They are typically straight and regular, and intersect only at nodal points of power. (Ingold, 2007, p. 81)

Ingold associates the rise of transport with the emergence of capitalist modernity. Wayfaring thus represents the pre-modern, and also the true essence of being human. While powerful, Ingold’s account is a dichotomous simplification of history. I prefer to seek a somewhat more nuanced, albeit still schematic, account of historical modes of mobility. This account is couched in the succession of dominant historical types of work: from craft to mass production, mass customization, co-configuration, and eventually to social production or peer production (see Victor & Boynton, 1998, Engeström, 2008).

As pointed out by Lave and Wenger (1991; see also Rorabaugh, 1986), in traditional craft activities, mobility was directed from the periphery to the center: novices gradually becoming masters. This is very different from the wayfaring notion of Ingold. It may be argued that in craft, wayfaring happened only as a temporary exception, represented by the Wandergesellen, wandering journeyman or ’tramping artisans’ (Hobsbawm, 1964).

In mass production activities, mobility is directed forward and upward in a linear manner: the assembly line process, the business process, and the individual career (e.g., Walker & Guest, 1952; Kanigel, 1997). A well-designed
industrial process is in a way the ultimate realization of Ingold’s notion of transport. However, the Fordist version of mass production has been modified and transformed in many ways since its inception. Today, variations of lean production (Womack, Jones & Roos, 1990) and mass customization (Pine, 1993) dominate the world of work. They contain important non-linear and interactive elements, such as iterative cycles of continuous improvement and negotiations with customers.

In social production or peer production (Benkler, 2006), the boundaries and structures seem to fade away. Mobility takes the shape of expansive swarming and multidirectional pulsation, with emphasis on sideways transitions and boundary-crossing. Processes become simultaneous, multi-directional and often reciprocal. The density and criss-crossing of processes makes the distinction between process and structure somewhat obsolete. The movements of information, people and things create textures that are constantly changing but not arbitrary or momentary. The textures are made up of traces or trails which are both cognitive, ‘in the mind’, and material, ‘in the world’. Wikipedia is a good example in that every alteration of an entry is automatically stored and retrievable for anyone as a cumulative record of previous versions and alterations. So the constantly moving texture is also multi-layered and historically durable.

So does the emergence of social or peer production mean a return to Ingold’s wayfaring? Three historically significant differences must be pointed out. First, actors engaged in social production are in it to achieve and produce something, they are oriented toward an object. They do not look like the idle wanderer implied by Ingold’s account. Their object is open-ended and unpredictable, but it has tremendous drawing power and motivational force (Knorr-Cetina, 1997). Secondly, the swarming movement of peer production is foundationally collective, in contrast to the image of an individual walker evoked by Ingold’s account. Thirdly, the new patterns of social production do not take shape in pure forms. They hybridize and seek symbioses with the vertical and linear structures of mass production (e.g., Siltala, Freeman & Miettinen, 2007). It is these hybrid and symbiotic forms that promise to open up historically new possibilities.

THE MEANING AND IMPORTANCE OF WILDFIRE ACTIVITIES

Today more than ever before, humans and their organizations are seeking models of activity that could enable continuous engaged self-renewal, innovation and expansion, yet be sustainable and not burn out their own energy and environment. Various forms of social or peer production with their swarm-like patterns of mobility are promising in this respect. However, they are commonly understood strictly as by-products of
the internet and therefore completely located in the sphere of digital virtuality. This view leads to an unduly narrow and historically limited understanding of the potential range and contents of such ‘wildfire activities’.

There are wildfire activities that predate internet and mainly take place outside the sphere of digital virtuality. Examples include skateboarding, birding, and disaster relief of the Red Cross. One of their salient qualities is that they can pop up in unexpected locations at unexpected times and expand very rapidly. They also seem to become extinguished from time to time, yet they reappear and flare up again.

These activities show remarkable sustainability and expansion in spite of a number of severe adversities and constraints: (a) they offer little monetary rewards, institutional support structures and legal protections, (b) they require excessive expenditures of time and energy, and (c) they carry a high risk of failure, trouble with authorities, or even physical harm. Yet these activities are constantly learning to transcend the constraints and overcome the adversities – in other words, to renew themselves without much deliberate and centrally organized effort. Transformative learning is not imposed upon the participants, but built into the very operating principles and everyday social textures of these activities.

Wildfire activities are full of paradoxes. They are discontinuous but demonstrate longevity and persist over time. They are dispersed and distributed, yet well coordinated and aware of the global whole in each local node. Typical to them is quick adoption and creative use of up-to-date information and communication technologies, but little emphasis and dependency on them. They do not create their own closed worlds of virtuality.

Wildfire activities offer little publicly recognizable rewards but are extremely highly motivated. These activities, sometimes characterized as forms of ‘gift economy’, have strong object and use-value orientation and resistance to thorough commercialization. In this respect, wildfire activities represent more than just general ‘swarm intelligence’ or ‘smart mobs’ (Rheingold, 2002). Trading in global financial markets may also be characterized as swarming (see Knorr-Cetina, 2005). Driven by the maximization of profit, it is essentially greedy swarming that eventually leads to destructive consequences, as amply evidenced by the financial crisis of 2008. Wildfire activities represent the possibility of virtuous swarming among humans.

These activities are not just Wikinomics (Tapscott & Williams, 2007), or very large numbers of people engaged in something. They are not just social network sites, such as MySpace, YouTube or Facebook. They are not just internet, and they are not just open source. Birding, skateboarding and disaster aid of the Red Cross are very bodily and down-to-earth activities.

Wildfire activities are very mobile. Their mobility is both physical move-
ment of the actors and virtual movement of information and ideas. Significantly, it is also movement of the objects of the activity. This is particularly clear in the case of birding. Birders follow the movement of their objects, the birds. Here is an example, an e-mail message from November 19, 2008, submitted to a Finnish birders’ discussion list ‘Lintuverkko’ (lintuverkko@birdlife.fi).

Hi,

Two Finnish cranes under satellite monitoring reached Tunisia yesterday and today. The birds were equipped with transmitters in Salla and Maaninka [in the Finnish Lapland].

More about this:
http://www.satelliittikurjet.fi

Regards, Matti

Disasters, the objects of Red Cross disaster relief workers, are mobile in the sense that the location of the next disaster is usually moreless unpredictable. Something like this is also evident in skateboarding. Skateboarding spots in cities have finite life cycles, they are frequently made inaccessible, so the skateboarders must move to new spots. These are varieties of mobility of the object as source of mobility of actors and information.

COMMUNITIES AS MYCORRHIZAE

Traditional craft communities were relatively closed and stable, they were cradles of ‘Gemeinschaft’ dominated by tradition and the personal authority of the master. Communities of mass production are rule-governed and relatively transparent, but also clearly bounded and centrally controlled (see Adler & Heckscher, 2006, Engeström, 2007).

Communities associated with wildfire activities are hybrid and poorly bounded; in them, the center does not hold. They resemble mycorrhizae, the invisible undergrowth of fungi. Mycorrhizae are symbiotic associations between a fungus and the roots or rhizoids of a plant. They grow through and within the substrate on which they are feeding. They have a very large surface area compared to their volume, but no single center. They are difficult if not impossible to bound and close, yet not indefinite or elusive. They are very hard to kill, but also vulnerable. They may lie dormant for lengthy periods, then generate again vibrant visible structures when the conditions are right. They are made up of heterogenous participants working symbiotically, thriving on mutually beneficial and also exploitative partnerships.

Birding may be regarded as a symbiotic or hybrid community of birders, producers and distributors of birding equipment, professional ornithological or ecological researchers, and conservationists. Skateboarding may be regarded
as a symbiotic or hybrid community of skaters, merchandiser-sponsors, skateboarding media, and the often rather hostile owners, inhabitants and officials of the urban spaces amenable to skateboarding. The Red Cross disaster relief may be regarded as a symbiotic or hybrid community of volunteer relief workers, professional organizers of non-governmental relief efforts, local victims, and governmental agencies from local up to international levels.

In other words, these communities are heterogenous and partly ad-hoc, made up as the situation demands. They are temporary and fragile, yet also amazingly durable and sustainable. Their membership is not well defined or guarded. Membership is gained by virtue of contributing something to the endeavor of the community.

These characteristics of a mycorrhizae community may be largely explained by the phenomenon of stigmergy.

*Stigmergy is a mechanism of spontaneous, indirect coordination between agents or actions, where the trace left in the environment by an action stimulates the performance of a subsequent action, by the same or a different agent. Stigmergy is a form of self-organization. It produces complex, apparently intelligent structures, without need for any planning, control, or even communication between the agents. (…)*

*Stigmergy is not restricted to eusocial creatures, or even to physical systems. On the Internet there are many emergent phenomena that arise from users interacting only by modifying local parts of their shared virtual environment. Wikipedia is an example of this. The massive structure of information available in a wiki, or an open source software project such as the Linux kernel could be compared to a termite nest; one initial user leaves a seed of an idea (a mudball) which attracts other users who then build upon and modify this initial concept, eventually constructing an elaborate structure of connected thoughts. (Wikipedia, entry cited on January 1, 2009)*

Stigmergic coordination has the important quality of mediation by material and thus relatively durable traces, such as mudballs in the case of termites. Heylighen (2007, p. 165) argues that in open source or open access communities stigmergy happens by means of listings of ‘work-in-progress’ that “direct potential contributors to the tasks where their contribution is most likely to be fruitful.” I have argued (Engeström & Ahonen, 2001) that material infrastructures are essential for the formation and sustainability of communities. It seems that the crucial infrastructure and thus the ‘social glue’ of a mycorrhizae community consists of patterned accumulations of the material traces themselves.

Stigmergy works in wildfire activities. Birders document their sightings in meticulous detail and spread them through various channels to their colleagues. A competent birder has at any
moment access to a large variety of documented sightings that he or she can rely on when orienting to his or her own excursions. Similarly, skateboarders very commonly videotape or photograph their moves and sites and share the images through numerous channels. Again, a competent skater typically has access to a large variety of images and stories of recent skate spots and moves performed in them. Birders and skateboarders may not use, analyze or discuss these documentations, images and stories in any deliberate and goal-directed manner. Yet they serve as necessary infrastructure that allows the practitioner to contribute to the maintenance and development of a mycorrhizae community.

Disaster relief work is a more complex case from the point of view of stigmergy. A disaster is by definition chaotic. Meaningful traces for orientation and coordination are hard to identify on the ground, in the midst of the chaos. Thus, various support systems are being designed for relief workers.

On behalf of the European Commission, the German Aerospace Center (DLR) has developed a system that enables disaster relief workers to access up to date satellite images while being in the field and exchange data among themselves. The system has been tested within the framework of the EU-project LIMES (Land and Sea Integrated Monitoring for European Security; http://www.fp6-limes.eu/), which develops and applies satellite-based technologies in the field of security for Europe. Similarly, the United Nations is working to provide a web-based knowledge portal for disaster management and emergency measures for the disaster relief workers. Coordinated by the UN-SPIDER program (United Nations Platform for Space-based Information for Disaster Management and Emergency Response; http://www.oosa.unvienna.org/oosa/spider/index.html), this platform is meant to offer the opportunity to supplement satellite scenes and maps following a disaster with information gained on the ground. Rapid access to such information is necessary because, after disasters like the earthquake in China or the cyclone in Myanmar, rescue teams need to find out as soon as possible what type of aid is needed where. Support is given by the new system from space: with the help of satellite images, the relief workers receive an overview on blocked roads or destroyed buildings.

By means of computer software, they then synchronize their observations on the ground with the satellite images and feed the data to a specialized network via satellite. The aim is to speed up the investigation of disaster areas so that the exact support that is needed arrives as soon as possible. The more field teams are able to connect with each other, share their results and transfer them, the quicker and more effectively the international community will be able to help in a disaster.

The satellite images combined with continuously updated on-the-ground observations are supposed to provide for a new kind of infrastructure for stigmer-
gic coordination. In fact, this combination of top-down and bottom-up views represents a merger of stigmergy and the ‘holoptic’ principle. According to Bauwens (2005), a ‘holoptic’ space allows all the participants of an activity to access both horizontal knowledge, of what others are doing, and vertical knowledge about the emerging totality.

Elliot (2006) maintains that stigmergy reduces the importance of social negotiation, as it is possible to contribute to Wikipedia for instance without discussing what you are contributing to or creating. But, as Elliot also acknowledges, this does not mean that negotiation, criticism, debate and deliberate concept formation are absent in activities based on stimergetic coordination.

In the Linux development community we observe a peer review process as a structured approach to generating criticism of existing versions, evaluating these criticisms, and eliminating ‘error,’ while retaining those solutions that cannot be falsified.” (Lee & Cole, 2003, p. 639)

Birders frequently comment on each other’s sightings and interpretations. They discuss alternative explanations to observed frequencies and scarcities of members of particular bird species in particular areas. Skateboarders develop moves that become named concepts and shape the vocabularies and repertoires of skater communities. Disaster relief workers have to negotiate, establish and name stable points for distribution of medical help and other forms of relief.

We may now summarize some key features of the three wildfire activities discussed in this article. The key features in Figure 1 include the object of

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**Figure 1. Key features of three wildfire activities**

<table>
<thead>
<tr>
<th>OBJECT</th>
<th>MOVEMENT</th>
<th>COMMUNITY</th>
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<tbody>
<tr>
<td><strong>BIRDING</strong></td>
<td><strong>BIRDS</strong></td>
<td><strong>HYBRID OF BIRDERS AND RESEARCHERS</strong></td>
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<td></td>
<td><strong>SWARMING PUNCTUATED BY BIRD MOVEMENTS</strong></td>
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<tr>
<td><strong>SKATEBOARDING</strong></td>
<td><strong>URBAN SPACE</strong></td>
<td><strong>HYBRID OF SKATERS, SPONSORS, AND MEDIA</strong></td>
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<td><strong>SWARMING PUNCTUATED BY LIFE CYCLES OF SKATING SITES</strong></td>
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<tr>
<td><strong>DISASTER RELIEF</strong></td>
<td><strong>DISASTERS</strong></td>
<td><strong>HYBRID OF RELIEF WORKERS, VICTIMS, AND OFFICIALS</strong></td>
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<tr>
<td></td>
<td><strong>SWARMING PUNCTUATED BY OUTBREAK AND REPAIR OF DISASTERS</strong></td>
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the activity, the nature of the movement of the activity, and the character of the community of the activity. To get beyond this relatively descriptive characterization, we need a conceptual framework that can serve as springboard for both theory development and empirical studies. A sketch toward such a conceptual framework is presented in the next section.

COGNITIVE TRAILS AND ENCOUNTERS

Adrian Cussins (1992) suggests that the foundational mechanism for cognition, concept formation and learning is exploratory movement in space – whether physical, mental, discursive, or virtual. Cussins’ theory is an account of embodied cognition where the basic metaphor is that of a person moving in a territory. The key concepts are perspective-dependence (PD) and stabilization. Imagine a person standing somewhere in the middle of a city. The person’s ability to find his or her way to any desired location regardless of the person’s initial position is called perspective-independence. In such case, the PD ratio is high - close to 1. The PD ratio is close to zero when the person is completely unable to find his or her way to any desired location in the territory.

People learn to move around in a territory by moving around in the territory. In so doing, they make cognitive trails. Trails are both person-made and world-made, and what makes persons and worlds. Trails are in the environment, certainly, but they are also cognitive objects. A trail isn’t just an indentation in a physical surface, but a marking of the environment; a signposting for coordinating sensation and movement, an experiential line of force. Hence the marking is both experiential and environmental. (Cussins, 1992, p. 673-674)

Each trail occurs over time, and is a manipulation or a trial or an avoidance or capture or simply a movement. It is entirely context-dependent [...]. Yet a trail is not transitory (although a tracking of a trail is): the environmental marking persists and thereby the ability to navigate through the feature-domain is enhanced. (Cussins, 1992, p. 674)

As multiple trails are marked, some trails intersect. Intersections are landmarks. A territory is structured by means of a network of landmarks. Such structuring means increasing the PD ratio.

Along with the PD ratio, there is another dimension that characterizes the development of cognitive trails, namely stabilization. Stabilization may also be characterized as blackboxing.

Stabilization is a process which takes some phenomenon that is in flux, and draws a line (or builds a box) around the phenomenon, so that the phenomenon can enter cognition (and the world) in
a single act of reference [...]. (Cussins, 1992, p. 677)

There comes a time when it is best to stabilize a network of trails so that the space is treated cognitively (functions) as a given unit (an object!), and then build higher-order feature-spaces [...]. (Cussins, 1992, p. 679)

One familiar and important way in which stabilization is achieved is by drawing a linguistic blackbox around a feature-space: the imposition of linguistic structure on experiential structure. [...] A region of feature-space starts to function as an object as it is dominated by a network of trails and stabilized by a name. (Cussins, 1992, p. 679-680)

In Figure 2, the point of maximum generality is depicted with the help of an oval. This is where stabilized objects, concepts and explicit propositions emerge.

Cussins depicts cognition as “appropriate spiraling” in the two-dimensional terrain depicted above. He calls this movement “virtuous representational activity.”

The course of a cognitive phenomenon (a dynamic, representational activity) may be plotted on a graph whose axes are the PD ratio of the cognitive trails and the degree of stabilization of the cognitive trails. Let us suppose that an activity starts out with low PD ratio and low stabilization. As the field starts to become structured – the creatures start to find their way around a landscape (as the theorist would say) – PD ratio will increase. A network of cognitive trails is temporarily established, and this provides for the possibility of stabilization. Both stabilization and PD ratio continue to increase, until the work concentrates almost entirely on the stabilization of trails that are in place. However, once a network of trails is tightly stabilized it

Figure 2. Generality as high PD ratio and high stabilization (Cussins, 1992, p. 683)
becomes less flexible, and as the nature of the field of activity changes over time, PD ratio will start to decrease as stabilization increases. Further improvement in way-finding will then require that a destabilized region of cognitive trails be established for a period of time in order to allow PD ratio to increase again. In other words, virtuous representational activity is the effective trade-off of the relative merits and demerits of PD ratio and stabilization. Virtuous activity may itself be represented as a figure, a shape, in the two-dimensional space of the PD ratio/stabilization graph. It is not hard to see that the virtuous form of representational activity has the shape of a spiral. (Figure 3; Cussins, 1993, p. 249-250)

Cussins’ theory of cognitive trails depicts change as construction and maintenance of multiple intersecting trails across an unexplored field or terrain, gradually leading to a stable conceptualization of the terrain, and subsequently again to destabilization. The terrain may be understood as a zone of proximal development for the actors who enter it. The terrain, or the zone, is both material and mental. Importantly, the theory of cognitive trails has no built-in linear directionality, closure or finalism in it. The trails take multiple directions, there is no untouchable predetermined goal, and the contents of the emerging concept are open.

All this resembles the ideas of Ingold – who interestingly enough does not refer to Cussins’ work. One might argue that between the two authors there is a cognitive trail that has been dormant for some fifteen years and becomes visible when a third party constructs an encounter between the two.
In Cussins’ account, and to a large extent also in the work of Ingold, the maker of the cognitive trails, or the wayfarer, is tacitly depicted as an individual moving in relatively pristine space. But there is no such pristine space. What is missing in these theories is interaction between wayfarers’ trails and already existing stable lines of transport vested with power. The Cussins-Ingold line of analysis needs to be complemented with the concept of encounter.

Recent discussions of mobile libraries (Needham & Ally, 2008) illustrate the need for the concept of encounter. The new library users are often depicted as constantly moving nomads. The library must offer accessible and effective services to these nomads. In this picture, librarians are curiously invisible or replaced by ‘intelligent agents’: “The virtual librarian could be an avatar that is created by the user, based on individual preferences.” (Ally, 2007, p. 43) This vision easily generates an invisible underclass – or an oppressive ruling elite - of centralized information providers who serve – or manipulate – the nomadic users. It would be more interesting to depict librarians as themselves mobile professionals who move between user communities and libraries to negotiate, create and maintain partnerships which require serious boundary crossing and hybridization. There is some good research evidence that speaks for this view.

Very often, a problem in one setting can be understood only by moving to a different setting. Indeed, problem solvers may need to move in an iterative fashion between settings because, as they gain knowledge in (and about) one setting, they become better able to recognize and use the knowledge in (and about) another setting or location. In effect, by relocating problem solving activities, learners change the structure of the problem, the options for action, and the knowledge they can act upon. (Tyre & von Hippel, 1997, p. 79; see also Engeström, Engeström & Kärkäinen, 1995)

The notion of encounter or boundary encounter has been used by various authors (e.g., Wenger, 1998, Kerosuo, 2001, Cobb, McClain, Lamberg & Dean, 2003), yet it has not gained the theoretical and methodological status it deserves. Elaborating on the related concept of social interface, the sociologist of development, Norman Long (2001) provides a useful step toward strengthening the notion of encounter. For Long (2001, p. 89), social interfaces imply “ongoing contestations and negotiations over meanings, values and intentionalities.”

The notion of interface provides a heuristic device for identifying the sites of social discontinuity, ambiguity and cultural difference. It sensitizes the researcher and practitioner to the importance of exploring how discrepancies of social interest, cultural interpretation, knowledge and power are mediated and perpetuated or transformed at critical
points of confrontation and linkage. (Long, 2001, p. 89)

An encounter may be characterized as a set of interactions between actors with different cultural backgrounds and interests focally involved in the transformation or redefinition of a partially shared challenging object. I have suggested the concept of knotworking (Engeström, Engeström & Vähäaho, 1999, Engeström, 2008) to capture the growing importance of encounters in co-configuration and social production. In this perspective, an encounter may be understood as an effort to construct a temporary yet effectively collaborative knot of heterogeneous actors and their lines of movement.

Encounters occur when different lines of movement come together. Of particular interest are critical encounters between predominantly non-linear way-faring trails and predominantly straight-forward lines of transport. Examples of the latter would include tension-laden encounters between skateboarders and officials or owners of urban spaces, as well as between skaters and businessmen making profit from selling skateboarding gear and clothing.

The collaboration between birders and professional researchers of ornitology and ecology is a predominantly benign example of such encounters. An example of a conflictual encounter among birders is the partly heated exchange that ensued before and after the Christmas of 2008 in the Finnish birders’ discussion list 'Lintuverkko’ (lintuverkko@birdlife.fi) concerning the relationship between religion and birding.

NEW POTENTIALS FOR LEARNING

As a working hypothesis, I will discuss six features that seem to be characteristic of the potentials of learning that emerges within wildfire activities.

1. Learning in wildfire activities is learning by swarming that crosses boundaries and ties knots between actors operating in fractured and often poorly charted terrains. These characteristics call for a reworking of Vygotsky’s (1978) foundational concept of the zone of proximal development, and of my own collective and expansive redefinition of this concept (Engeström, 1987).

In wildfire activities, a zone is a terrain to be dwelled in and explored, not just a stage to be achieved or a space to be crossed. The zone is explored by moving in it, to various directions and destinations, back and forth and sideways. The dwellers create trails and the intersecting trails gradually lead to an increased capability to move in the zone effectively, independently of the particular location or destination. The zone is never an empty space to begin with; it has dominant trails and boundaries made by others, often with heavy histories and power invested in
them. When new dwellers enter the zone, they eventually have critical encounters with existing trails. They both adapt to the dominant trails and struggle to go beyond them. The latter can lead to new trails that expand the collective shape and understanding of the zone, thus also to new boundaries. When the dwellers reach a certain level of mastery of the zone, they begin to collide with the very boundaries of the zone and to break away from the zone, toward new zones.

2. Learning in wildfire activities is learning by building mycorrhizae communities. It blazes embodied and lived cognitive trails and social bonds that make the terrains knowable and livable. The mechanism of stigmergy is foundational for the creation and maintenance of the material infrastructures of mycorrhizae communities.

3. Learning in wildfire activities is learning by constructing collective concepts that stabilize the trails and may serve as platforms for expansive restructuring of the activity. Such concepts typically emerge in and as a consequence of critical encounters between different lines of movement in the terrain. Encounters engender debate, analysis and negotiation.

4. Learning in wildfire activities is learning by experiencing high-stakes personal involvement, risks and critical conflicts, and shifts of identity.

5. Learning in wildfire activities is learning by combining quick improvisational adaptation and long-term design.

6. Learning in wildfire activities is learning by holoptic monitoring. It is oriented toward gaining a global view of events while engaged in intense local action.

These six features have significant consequences with regard to pedagogical, technological and organizational arrangements aimed at supporting learning. Of course wildfire activities are still somewhat exotic phenomena and one may argue that they offer little for the understanding and design of mainstream learning. Such a stance is a serious mistake that overlooks the dynamics of history, which we are making.

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