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Abstract

Critics and researchers apply various criteria to evaluate the efficacy of VR, including the conformity of VR environments to the character of place. I wish to add a further test: do VR environments enable thought? The paper thus applies to VR the controversial proposition advanced by Clark and others that thinking, i.e. human cognitive processes, are situated and spatial. As a further term in this mix I introduce the concept of non-place, as elucidated by Augé and propose that non-places can be characterized as unthinking spaces, i.e. spaces that provide little assistance to the thought processes of their occupants. Perhaps non-places only offer the possibilities afforded by a kind of cognitively impoverished instrumentalism. The conclusion from these propositions is that it is instructive to couch the problematics of VR environments in terms of non-places that do not easily accommodate thought, or thoughtful interaction, were it not that thought thrives on transitions, thresholds and boundary conditions between the strange and the familiar.

Keywords : Human cognition, place, non-place.

Virtual reality (VR) frequently aims for fully immersive, digitally-mediated experiences that convince us that we are in a physical space in the same way that we are in our living room, walking down the street, or talking with friends in the pub (Benedikt, 1994 ; Heim, 1998 ; Champion and Dave, 2002). (Here I distinguish VR from lower-aspirational, task-specific simulations, as exhibited in the case of flight simulators for training.) There are interesting mappings to be explored between experiences of VR and concepts of space and place as expounded by architects, human geographers and anthropologists (Relph, 1976 ; Norberg-Schulz, 1980 ; Meyrowitz, 1985). In spite of their claims to sociability, claims summarized by Champion and Dave (Champion and Dave, 2002), VR environments are far removed from the meaningful places of everyday habitation. To complete the comparison with architecture, geography and anthropology, we need to consider VR in relation to the controversial spatial category of non- places.

Non-Place

According to Marc Augé, non-places are the generic spaces and globalized environments we experience as airports, motorway underpasses, car-parks and other custom-designed and left-over spaces of mass production, consumption and global capital . In contrast to traditional places, where orientation and belonging are predicated on localized inhabitation, non-places are designed or under-designed, to be experienced by transitory and mobile agents: shoppers, commuters, corporate nomads, tourists, itinerants, the homeless, migrants and virtual workers. Non-places are frequently beleaguered with directions and instructions: do not park here, exit in the event of fire, no entry, please have your passport ready.

Mobile workers increasingly find themselves in these non-places, as they complete correspondence, reports, or drawings on the train, the airport lounge, the coffee shop and travel to meetings and conferences. In turn, aspects of non-place are brought back into the office or studio, if they have one. The office is sometimes an adjunct to peripatetic working in non-place, or subservient to the exigencies of time zones, global commerce and international regularization.

Non-places at their least accommodating also include dysfunctional environments in which people queue for poor service in badly-run, inadequately designed and impersonal bureaucratic settings. Environments in which the only imperative for human interaction is to effect a

scarcely concealed indifference to people and their welfare. These observations are corroborated by our recent studies of non-places in which we conducted on-site workshops at a superstore, airport and immigration office (Coyne, 2005 ; Coyne, 2006 ; http://ace.caad.ed.ac.uk/Non-Place (http://ace.caad.ed.ac.uk/NonPlace/)). Clearly, the concept of non-place opens up new and interesting spatial categories that resonate with certain aspects, desirable and otherwise, of contemporary environments.

Of course, Augé's ideas about non-place have been subjected to critique. In an interesting article on the service stops of the M1, quintessential non-places, Merriman identifies problems with the disciplinary differences within Augé's commentary, his overstatement of the newness of the phenomena he labels as non-place and his failure to appreciate the complex relationships between the material and the social in the constitution of place. Augé's critics are quick to point out that "individuals such as maintenance workers, security guards, shoppers or business travelers often do see spaces such as supermarkets, motorways and airports as places" (Merriman, 2004), replete with identity, meaningful interaction and nostalgic recollection.

Non-place is an ill-defined and ambiguous category. It is clearly a contested category. So are the concepts of virtual reality and place. Non-place arguably serves as a palliative to the romantic approval of and nostalgia for, place, as idealized by several urban theorists (Alexander, et al., 1977 ; Norberg-Schulz, 1980 ; Cullen, 1995 ; Rogers and Gumuchdjian, 1997). Non-place constitutes the "reality" for many of us, at least for some of the time. Non-place fits as a category for those situations, experienced by most of us, in which we are not at a lively Mediterranean waterfront café, nor surrounded by cobbles, ironwork and patinated sandstone as depicted in so many reflections that take as their starting point the celebration of place.

For digital environments, in many cases, the detachment, coarse graphics and the desperate nature of anonymous social intercourse (Castells, 2001), promoted in chat rooms and multi-user games (Kline, et al., 2003), suggest social dislocation and placelessness, indicative of non-place. The vacancy, violence and artificiality of some computer game worlds similarly speak of the disconnected, the placeless and the uncanny (Coyne, 2005), at least to non-participants. People cope with physical non-places and some people seem to thrive in them. Aspects of VR seem to resonate with concepts of non-place.

Complaints about VR

Technical challenges to VR are summarized by Champion and Dave (Champion and Dave, 2002). We can add that the concerns that VR seems to address are becoming more diffused as an aspect of human-computer interaction design in general, as we think of mobile systems and ubiquitous computing (Weiser, 1991), for which the dominant philosophy is one of embodiment and situated action (Suchman, 1987 ; Dourish, 2001). Where credence at all is granted to VR, from the embodied point of view, the technologies that we label VR implicate a series of embodied, equipmental practices that require skills in particular modes of perception, projection and interpretation. The practices of use of the particular VR equipment contribute to the VR experience, which is never achieved through a seamless integration of mind with computer, as if the equipment and the bodies that use it will someday be dissolved. Success in assisting those with mobility impairment through brain-computer connections indicates the requirement for extensive, equipment-dependent training (Friehs, et al., 2004).

Arguably, VR features as an important player in narrative invention whose home territory is science fiction literature and film and well-worn metaphysical speculations debating realism and idealism (Baudrillard and Lancelin, 2004). The concern with VR is also diffused into technical concerns with task-specific simulations, as in the case of flight simulators and environments for training in surgical skills (Wierinck, et al., 2005 ; Hirst and Wilkins, 2006), the technologies of heads-up displays, robotics and "telepresence." The effectiveness of VR

Rather, it is the strong claims (Benedikt, 1994 ; Heim, 1998) made of VR that it is on the way to serving as a generalized, sensory-rich medium that suits a variety of contingencies, as rich as those provided by physical experiences outside of the VR system. It is as if, without adjustment, a flight simulator could suit bird-watchers as well as trainee pilots, or a surgical simulation could be used to dissect a wristwatch or purvey hospital gossip. The ideology of VR celebrates the prospect of a fully-immersive, sensory-rich, complete and general digital environment. Some advocates of this ambition see the main impediment to the progress of VR as the implementation of components that guarantee place. In so far as the success of VR is to be completed through a consideration of the characteristics of space and place, I propose that it needs also to address the characteristics of non-place and non-place as an environment that potentially impedes thought.

Thinking Places

We can address the topic of non-place indirectly through concepts of situated cognition. Champion and Dave outline factors that contribute to a sense of place, at least in virtual environments. These include provision for social agency, the presence of artifacts that can be transformed and dynamic interaction. I would like to add a further consideration of what constitutes “placefulness,” that is only partly accounted for by these provisions, namely cognition. Rich, meaningful, or even just everyday places are cognitively enabling. They facilitate thinking.

So, in addition to considerations of non-place, I wish to consider the implications for VR of theories about embodied and embedded action, particularly as expounded with great clarity by Clark (Clark, 1997 ; Clark, 2001 ; Clark, 2003) in the context of studies in neuroscience and robotics. Clark focuses less on space than on the claims made of the material brain as the organ of reason. He cites experiments that show how the task of the human brain is mainly to make connections, complete patterns and draw on the elaborate “scaffolding” we call society, culture and context: “Advanced reason is thus above all the realm of the scaffolded brain: the brain in its bodily context, interacting with a complex world of physical and social structures” (Clark, 1997).

What is the mechanism of thought? For these theorists, the role of the thinking agent, the brain is to “support a succession of iterated, local, pattern-completing responses” (Clark, 1997). On the one hand this sounds like a very reductive formulation: thought as pattern completion. But it elevates the importance of the environment. Thinking, reasoning and acting are co-implicated in the embodied and increasingly equipment-rich environments we inhabit. Thought is “out there” as much as it is in the head or the body.

Similar arguments have been advanced about the distributed nature of memory by Rosenfield (Rosenfield, 1988). Memory and cognition are situated and by extension, they are spatial. There are interesting implications here in how we think of space: less as a container than as a social enabler within a cognitive scaffolding. The corollary is that our thinking apparatus is perplexed and confounded in environments in which the cognitive scaffolding is deficient, as in environments that tax the resilience of the human organism, spaces devoid of sensory and cognitive stimulation. Clearly, if places implicate, assist and abet thought, then VR spaces ought to do the same.

What does a theoretical shift from the transcendent and disembodied to the cognitive scaffolding of our cultural, spatial and equipmental context imply for VR research? The “situated” response is often to dismiss VR as founded on poor models of human experience and cognition, as giving undue emphasis to “internal representations” and replacing the body with a series of digital conduits to channel sense data. There is a case to be made that equipmentally-mediated environments (such as provided in VR) contribute to work, creativity and play and therefore to cognition in general. But not in the ways expected. Theories of situated cognition

As elaborated by Champion and Dave, we commonly presume that the test for VR is whether the immersed participant is successfully convinced that she is in a space. Does the VR environment look and feel real? The question also expands to how the environment sounds? In other words the test pertains to the senses, understood as discrete and reliant on the provision of high-fidelity sense data and prioritizing vision.

Theories of situated cognition suggest a different test. Outside of the task domain of the VR simulation, can you think in this space (or through this space)? If the space represented is architectural, e.g. a virtual airport lounge, could you settle down to read a book, mark up a report, rehearse your next meeting, muse on the future of shopping, start to categorize passengers, or plan your next holiday. If you could, would it be abetted by the VR space, or in resistance to it? This is a variant of a more general formulation: does the VR environment support human practices? Taking on board the views of the situated cognitivists, that thought is action-oriented, environment-complicit and spatial, the test becomes: can you think with this space? Does a VR environment constitute a thinking place? Could you be stimulated, informed, or distracted in a virtual airport in the same way as when you are at Stansted? But perhaps Stansted airport is a non-place, the users of which are already under the sway of cognitive deficit.

Non-Space and Cognition

Before continuing to question VR in the light of situated cognition, it is helpful to consider non- place through the same criteria. Place constitutes a rich sensory environment imbued with memories, significance and meaning. Places are also spaces in which things happen, the domain of praxis. This active doing implicates thought. We don't only think about places, but we think through them. Places seem to function cognitively.

The question of the cognitive attributes of space has a history that precedes speculations in neuroscience. Buildings have long been regarded as embodying meanings, communicating meanings and serving as signs and semiotic systems (Jencks and Baird (eds), 1969). Frescoes, stained glass, statuary and ornamentation have obvious educative functions in both sacred and secular architecture (Jones, 2000). Adrian Snodgrass has examined the cognitive functioning of the mandala in terms of metaphor (Snodgrass and Coyne, 2006). Frances Yates also indicates the ancient legacy by which orators would use the environment around them to structure and remember the main points of an argument (Yates, 1966).

This recourse to spatial mnemonics was not purely instrumental. There was also a sense of participating in the divine order. In fact, for Plato, the concept of Intellect was of a supra-individual and divine stratum of coherence into which all of humanity could connect. Thought (as Intellect) was understood spatially as a passage to a transcendent condition. There is also the persistent legacy of the Romantics drawing on the environment for personal inspiration. The Romantic grand tour was an occasion enjoyed by creative individuals to study, contemplate and mine foreign and unfamiliar territory. For the newly mobile British bourgeoisie, continental Europe was at one time a territory “to think with,” a role also extended to “the Orient.” As outcomes of the colonial impulse, museums, galleries and specimen gardens fulfill a similar role. Spaces aid thought in the obvious case where the scholar seeks out specific information, such as mummification practices in Egypt, or the leaf pattern of a Banksia oblongifolia.

But such environments also function as places in which thoughtful associations can be made and one could participate in a sense of Platonic ordering and participate more fully in the Thought of humankind (Hooper-Greenhill, 1992). Thought, with a capital “T,” as a faculty that goes beyond the mere thinking of an individual agent, was also a preoccupation of Hegel and Heidegger. Hence, Heidegger’s enigmatic conflation of building, dwelling and thinking (Heidegger, 1971). My case for a consideration of “spatial/placial cognitivism” could be mounted

situated cognition when considering the instrumental, fine-grained medium of VR. Both draw on concepts of computation.

Cognitive Apparatus

Let us return to propositions about the way cognition might operate. According to cognitive theorists (Gregory and Zangwill, 1987), classical theories of cognition (as advanced by Descartes) position thought, mind and cognition firmly within the organ of the brain. It all happens inside, with the environment providing the distractions or noise, or the environmental conditions that keep the body in a comfortable state so that the brain can get on with its work. Thought is resident in the brain, which is contained within space. Situated cognition however advance a series of propositions that push cognition further and further into the environment. As evidence for their thesis Clark and Brooks cite experiments that show how “lazy” the brain is in accomplishing even simple cognitive tasks and how dependent it is on its environment.

The theories draw on mechanisms of timing and subtle inflection. In the case of mobility, a fish flicks against eddies formed by rocks to swim faster than it could by brute strength (Clark, 1997). This is not a reasoned contrivance by the animal; it is simply built into its physiology. Similarly, when animals walk they (we) use gravity and tilt their bodies, perpetually intercepting a falling movement with a minimal and efficient intervention that produces mobility. The body is designed so that gravity does much of the work. Cognition is similarly opportunistic. We use various tools to “cheat” our way through calculation, navigation and other cognitively demanding tasks. Measuring implements, calculators and the tools of writing are obvious examples.

Kevin Lynch’s work on the role of mental maps in navigating cities (Lynch, 1960) is often cited as a way of understanding VR. In terms of the language of situated cognition, landmarks are even more ubiquitous and necessary than suggested by Lynch and constitute wayfinding cheats to save on the need for cognitively expensive “internal maps” of our environment. In fact, debates within the literature around situated cognition commonly focus on the need or otherwise for “internal” representations. The strictly situated position maintains that we do not have and do not require mental representations of objects in order to think. Or, if we do, the representations are less like maps than task-specific templates (Clark, 1997).

The language used by these researchers into the philosophy of robotics is not architectural, though they admit an interest in the theories of Martin Heidegger and Merleau-Ponty, who address the human condition as primarily one of being thrown into the world, or “being-in-the-world.” Extending (and contorting) the phenomenologists’ metaphor of thrownness, like the fish that throws itself against the currents, we exploit states of cognitive instability to maneuver, or be carried along by thought.

What are the implications of situated cognition for architecture? There is clearly no simple correspondence between environment and thought. The theories of situated cognition do not suggest direct mappings between thoughts and architectural interventions. So we can dismiss the idea that architects can create places that make the inhabitants more intelligent, thoughtful, passive, active, better behaved or creative. To assert as much is to buy into long-discredited theories of environmental determinism (Dehaene, 2002). Environment and cognition involves a much looser fit.

How do theories of situated cognition inform concepts of work? Imagine a student or clerk working on an accounting problem in the reading room of a grandly designed neo-classical library. A naïve cognitivist would assert that the knowledge, or at least the information, is all in the books. The space is incidental and contributes little to the work task, other than providing comfort and convenience. According to a slightly more sophisticated view, the worker observes the paintings, wall friezes and configuration of pilasters and performs a pattern completion

and stimuli through which to think. Drawing assistance from the environment in this way no doubt occurs, but this account already assumes cognitive autonomy on the part of the worker.

Situated cognition presents the more radical proposition that our environment is already structured in a way that assists certain outcomes. In other words, the spatial operation of cognition is reflected in the fact that we are culturally predisposed towards libraries as places of contemplation and inspiration; our entire perception of such spaces is culturally loaded; the objects around us, natural and otherwise, are caught up in networks of interconnections, about which any particular instance provides a reminder. Sitting in a library while reconciling the office accounts suggests a certain coupling between thought and environment, especially when we reflect that the library and its history are brought about by the same social and cultural processes. Through our participation in culture we are as much at home with spreadsheets as libraries and the physicality of the library is just one part of this cultural scaffolding within which thought is constructed.

Furthermore, if we consider thought in a manner similar to the optimally mobile fish, opportunistically flicking its way through a submarine rock garden, then we can imagine thought deploying similar spatial gymnastics. Perhaps when “we bounce ideas around,” we are not so much the agents of this process as one of the rocks, or the current that is as much at the mercy of the configuration of the rocks as determining their configuration. We can leave it to the neuroscientists to elaborate further on the mechanism and further establish the complicity of space, environment, sociality and culture in thought. What is the role of the books on the library shelves? They serve a similar but substantially more structured and easily comprehensible role, explicable in terms of the instrumental nature of language as a highly sophisticated socially configured system of tools (Reddy, 1979).

Place and Cognition

We can conjecture a simple parallel. Places are those physical environments in which there is a ready complicity between culture, sociability and human practices. In Clark’s terms, in a place the cognitive scaffolding is in place, the resources by which the kinds of problems humans frame and resolve are readily to hand. The architecture and the artifacts within it provide the memories, the significations, the signs, the visual and spatial languages and the sounds, through which all the other social, cultural and linguistic components can operate. In other words the ensemble that is place is conducive to the operations of thought, appropriate to the condition in which the human finds herself in that place. For the worker, a place is a space for thinking with, or, in the language of situated cognition, a space in which the cultural, social and physical scaffolding is in place for effective thought to occur, by whatever agency.

My direct alignment of cognitive productivity and place is made independently of the literature on situated cognition, which seems less concerned with place and more concerned with task-oriented problem-solving and techniques for verifying the mechanisms. But the alignment is apt and impacts on how we view VR.

The Cognitive Resistance of Non-Places

So, as an expansion of the discourses of situated cognition we could assert that some environments are resistant (or neutral) to the processes of cognition. Such environments could be described as non-communicative, language-impaired or in some way pathological spaces. In light of the discussion so far the term “non-place” provides a useful descriptor of such environments. Non-places can be thought of as cognitively deficient spaces. They are either the interstitial, underdesigned spaces where nothing much is meant to happen, or they are those over-designed, over-controlled, monosemic or mono-functional spaces in which the chief cognitive demands are following directions, tracking a bureaucratic procedure, or parting with money (Augé, 1995). These spaces tell us what to do, through literal signage and the

This connection between non-place and cognitive deficit falls outside Augé's ethnographic language of sociability, language and symbol, but the connection fits. The common depiction of non-places in literature and film portray environments populated by people behaving like so many automata, who are so coupled with their mono-tasked environments that they behave like (mindless) cogs in a machine (e.g. Alphaville, Logan's Run, Brazil), a common perception recalling Marx's denigration of factory labor under capitalism (Marx, 1977).

If we assume the individual as the unquestioned agent of thought then non-places tell us what to think and what not to think. More precisely, in the language of situated cognition, non-places implicate a limited range of human action, being and engagement. Thought is not encouraged beyond the limits of the space's own particular cognitive project, typically limited to basic wayfinding, getting crowds from A to B, carrying out certain transactions (purchases) and herding people through a process (such as getting on a plane). Non-places deploy signs and symbols in the supposedly unambiguous language of the command ("wait here"), rather than relying on the rich layering of custom, history and meaning found in places.

A sign saying "wait here" would be superfluous in the vestibule of a cathedral or temple, as the appropriate behavior or action is already inscribed in the architecture and ritual practices of the place. Neither would we require a text saying "think of god," or "consider your finitude" in such places. In fact it could be said that we are already caught up in such thought by virtue of being in the sacred place or participating in its rituals. According to certain ethnologists, such as Eliade (Eliade, 1965), ritual is a kind of thinking that often bypasses the necessity for personal reflection or personalized knowing or belief. By way of contrast, our participation in the un-aspirational thought of non-places operates in a generic way, easily adjusted to the contingencies of the particular process by an adjustment to the signage or technological devices.

You can wear an iPod in a museum or church, but it is interesting to speculate that non-places require personalized digital enhancement to provide the cognitive scaffolding for thought that takes one beyond the thoughts of the space. Perhaps the mobile worker requires the iPod, mobile phone and laptop in order to compensate for the cognitive deficiency of non-places. Stansted might work as a cognitive environment thanks to the presence of the traveler's supplementary hardware: electronic diary, magazine, novel, credit card, iPod, mobile phone. Of course, VR is supplemental in the extreme. VR is all supplement, wherever we are.

VR as Non-Place

It takes little to think of VR environments as quintessential non-places. Their putative non-existence and imaginary, contested or interstitial manifestation qualifies them as such. The utopian, fantastical or violent aspects of computer game environments reinforce this designation. The environments of the game Grand Theft Auto are habitats for anti-social road warriors. VR is non-place in the sense that it is or can be devoid of all that makes for place. If VR functioned to the extent that we could be convinced of its spatiality then it is likely that it would be a place of brittle experience. Finally, VR is also a candidate for non-place in the sense that it might be construed as cognitively deficient, i.e. lacking the apparatus for thought to take place effectively.

In one sense VR has the potential to be cognitively very rich. Information, data and text can certainly be injected into VR, as content. We would be hard pressed to describe a row of books in a library or airport bookshop as constituting cognitive impoverishment, or to discount the cognitive cornucopia of the Internet and the World-Wide Web. But to ascribe VR's cognitive richness to the wealth of data it makes available is a little like conflating the quality of the library building with that of the books it houses. The cognitive richness of a place is not tested by considering the content of its communication channels, but by attending to its material fabric. Arguments against VR from the point of view of situated cognition would assert that VR

In the same way that VR gravity has to be programmed and every inflection of avatar muscle calculated to effect real-time simulation, the condition for every thought has to be anticipated in the VR design. Of course, this might be the case for a hypothetical organism that is only reared on VR. In fact the VR experience cannot be considered in isolation. There are transitions to be negotiated. Such transitions implicate thought.

Thresholds as Thought Events

Theories of situated cognition point to close couplings between organism and environment, but rarely refer to abrupt changes in environment. Organisms exploit instability, in motility and cognition, as they flick and fall, using their inbuilt capabilities to arrest a particular movement before it goes too far, or to catch a current, in the ocean, or a sea of thought, that transports it to a new, advantageous condition. Architecture is only too aware of the value of instability, the edge and the threshold in spatial experience (Tschumi, 1994), a theme developed by Snodgrass in an article, “Thinking though the gap” (Snodgrass and Coyne, 2006).

As the surrealists discovered, thought events can have this character, of placing objects out of their usual contexts to produce a set of jarring and unusual relationships (an anvil and a sewing machine, an iPod and a crucifix). The metaphors used by researchers into situated cognition assume a certain stability and evolutionary progression to more elaborate and effective scaffoldings for thought. But the scaffolding can be rattled. No less so than by the worker moving into and out of environments. To place a worker in a new setting, e.g. to design part of a hospital while sitting in a café at the zoo, may certainly take thought into new territory, but it is also the movement itself that provides mobile working with its cognitive opportunities. From the point of view of design, thought happens at the thresholds, which places the mobile worker, as a crosser of thresholds, at a particular advantage. Clark alludes to the boundary aspects of cognition, but when he turns to design readily succumbs to the allure of seamlessly melded technologies (merging of machine with body). From our point of view design is abetted by a more agonistic, conflictual and problematical disposition towards spatial hardware and its edge conditions (Coyne, 2005).

Thought is abetted by movements into and out of place and non-place conditions. In everyday language: we make comparisons. The putative impoverishment of the out-of-town shopping mall reminds us of the richness of the old town. The journeying, catching the park-and-ride bus, being dismayed at the traffic, are not independent of the experience of place, but contribute to it, through comparison and contrast. Once in the town, as examined by both urban formalists (Cullen, 1995) and the Situationists (Zegher and Wigley, 2001), it is generally the contrasts between material conditions that excite thought: where paving gives way to water, the crowd disperses, concrete abuts foliage, shadows contrast with light, security intersects with hazard.

In a similar way, we can surmise that the VR experience is never just an experience in isolation, but the journey to the virtual laboratory, the positioning of the head-mounted display, or the jockeying for a place in the center of the cave. In the dim radiance of the VR spectacle, clarity admits interference, perspective contrasts with flat rendering, animation with stills, sound with sight. If these experiences are unfamiliar, then think of the spectacle of the computer screen and its environs, the expectation, or dread, of opening the computer game file, shutting down the computer, adjusting the seat, massaging a sore neck, the whole embodied experience of using a technology, remembering it, learning it, positioning it within a social and cultural context and acquiescing to the repetitions it requires (Coyne, 2003).

It is here that, in spite of its deficiencies, the cognitive value of non-place resides and renders it useful: in the contrasts it invokes and participation in the thoughts that play along the boundary condition. VR also invites thought and it achieves this by posing something strange and different. Whether the thoughts it invites are of use to us will simply depend on the circumstance and on how accepting or inured we are to the differences it invokes. In

Conclusion

My aim has been to open VR to a consideration of how it is that we think in space. I have given priority to the distinction between place and non-place advanced by Augé, rather than the distinctions offered by Relph and others about space and place. When the cognitive theorists I have referred to talk of space they are not singling out spatial experience from placial experience (though their discourse would no doubt be enriched by probing this literature).

I suggest that to the extent that thought is situated and therefore spatial (by no means an uncontested position), then we need to pay attention to the cognitive attributes of VR. If non-places are cognitively deficient, i.e. do not adequately abet thought (again, a position that is controversial), then we can further align the discourses of VR with those of non-place. Through the slippage of these contestations we can perhaps think our way through VR. My conclusion is that spaces/places are configured and signed, not just to "convey meaning," as containers for cognitive agents (people), or embodying ideas (or ideologies), but as actively complicit in thought. VR has to be thought through by attending to transitions, boundaries between conditions and thresholds.

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