

Creativity and Nonconscious Cognition: A Conversation with Mary Zournazi and N. Katherine Hayles

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Abstract

In this conversation, Mary Zournazi and N. Katherine Hayles explore some of the key elements around co-evolutionary functions of human and nonhuman modes of cognition. Drawing on the wealth of N. Katherine Hayles' work on these issues over the last thirty years, Zournazi and Hayles consider new modes of understanding and learning which are part of the rapidly changing world of digital and cognitive media technologies in the classroom and beyond. They consider the role of creativity, the necessary cognisance of new modes of learning, bodily orientations and technological evolutions that structure our individual as well as social and political lives.

Keywords: bodies, cognition, creativity, ecology, ethics, nonconscious, non-human life, technologies

Introduction

I want to start with a little story. Whilst working on this conversation, I was playing back the audio at a friend's place in the Blue Mountains, west of Sydney. I had been thoroughly immersed in the audio and thinking through aspects of the conversation when suddenly and expectedly, Siri said: 'I think so'. I was genuinely surprised and somewhat shocked. Later, I asked my friend about Siri, she said: 'Oh yeah! She's our music Siri thing on top of the microwave. She scares me sometimes...' On reflection, I consider this interplay between Siri and myself as a very small example of the worlds in which we now inhabit that are a combination of what N. Katherine Hayles might call 'technogenesis', and more broadly it involves the sense of the correlative nature of human and nonhuman intelligence.

In our following discussion together, N. Katherine Hayles and I explore some of the key elements around co-evolutionary functions of human and nonhuman modes of cognition. Drawing on the wealth of N. Katherine Hayles work on these issues over the last thirty years or so, we consider new modes of understanding and learning which are part of the rapidly changing world of digital and cognitive media technologies in the classroom and beyond. We consider the



role of creativity, the necessary cognisance of new modes of learning, bodily orientations and technological evolutions that structure our individual as well as social and political lives.

Mary Zournazi: A good starting point for us is to discuss the relationship of '*how we think*' in the processes of creativity and the construction of thought and how we imagine the world. You've written about the way thinking emerges through the correlative experience of technologies and it would be interesting to consider the questions of learning and *thinking with* technologies today in the light of covid and the usurpation into new forms of digital relationships and learning. In your recent works, you consider the difference between thinking and the idea of cognitive assemblage or cognition, which are two different things, and the distinction is vital to help us to navigate some of these issues around care and a future of learning ...

N. Katherine Hayles: As you probably know, I try to avoid using the concepts 'thinking' and 'thoughts' in my more recent work, because they're so heavily identified with consciousness. In my book, *Unthought*, I was specifically interested in looking at cognitive processes below consciousness, which I call the nonconscious or nonconscious cognition. I make a pretty clear distinction between the unconscious and the nonconscious. Of course, the unconscious has a long history of commentary with Sigmund Freud and Jacques Lacan. But more recent understandings of the unconscious are as a kind of broad background awareness, the sort of thing that kicks in when we're driving. There's a kind of automaticity that we learn through habit; it is in continuous and easy dynamic interplay with consciousness. The minute we need to, we can attend back to our driving as when, a car breaks in front, then immediately you snap back to attention. If you wanted to inscribe the Freudian or Lacanian unconscious in relation to this interplay, you might say that somewhere along the line, some trauma interrupted this smooth dynamic and walled it off from easy communication, so that then communication can only be achieved through dreams and symbols and so forth, and then you're in Freudian or Lacanian territory again.

The nonconscious has a completely different role to play with consciousness than the unconscious, as it was theorised by Freud and Lacan. Nonconscious cognition has only recently been recognised as such, and its functions have been clarified through experimental research. Nonconscious cognition performs vital cognitive functions interpreting the sensory information flooding into the brain from both external senses and internal senses like kinesthesia and proprioception. It synthesises various sensory inputs to come up with something like a coherent representation of what is the state of the body in the world at any given moment.

Nonconscious cognition has been demonstrated to operate much faster than consciousness does, and to be able to process information too dense and noisy for consciousness to be able to decode. There have been visual experiments where subjects have been asked to identify patterns in these densely coded images. They are unable to verbalise the patterns, but nevertheless they recognise them. That indicates some kind of cognitive function is at work, which is not verbal, but which nevertheless can discern patterns, make anticipations, and perform

habituations. My name for that is nonconscious cognition. It comes online, that is, it begins to operate within a very narrow window of 100 to 200 milliseconds after the onset of sensory information. By contrast, consciousness takes a full 500 milliseconds or half a second to be able to realise something is happening. So, information comes first into nonconscious cognition where it's processed, and then the neuronal systems associated with nonconscious cognition send forth activation waves, on the order of 200 to 400 milliseconds. If those waves do not receive reinforcement from consciousness, that is if consciousness doesn't pick up on and reinforce those waves, they die out.

An image that I like to think of is a youngster tugging at your sleeve for attention, and you can choose to ignore that tug, or you can pay attention to it. If you pay attention to it, then the information, as Stanislas Dehaene says, is activated by the global workplace. Then the information flashes into consciousness and can be sustained indefinitely. But if it's not picked up by consciousness, it never enters conscious awareness, and that information dies out relatively quickly.

Consciousness is the realm of symbolism, verbal language, and intentionality. Nonconscious cognition is more like a synthesiser combined with an interpreter that can forward information to consciousness in an active processual way. That is, nonconscious cognition doesn't just synthesise this information. It also modulates it. It can smooth out sensory discrepancies, for example minor temporal discrepancies, and can create a coherent temporal sequence. It can only do that up to a point of about a discrepancy of 100 milliseconds or so. Within this interval, the synthesised, interpreted, and coherent sequences it creates then enters consciousness as such. In a certain way, nonconscious cognition is more in touch with the body than is consciousness.

Because nonconscious cognition functions in the realm of nonverbal signals, it doesn't suffer from what Antonio Damasio in *Self Comes to Mind: Constructing the Conscious Brain* calls the narrating or autobiographical self that creates the internal monologue that we all hear in our heads. "Well, now I'm going to the store, blah, blah, blah." It does not function in the realm of verbal language. It is more in touch with what is actually happening in the body and in the world than is consciousness. And it doesn't suffer from the tendency of consciousness to create fabrications. One of the primary functions of consciousness, I think, is to make the world make sense. It's obvious this would have strong survival potential. If you are in a world that makes sense, you can operate in a way that is rational, that is controlled, that anticipates dangers, for example, and that can devise counter-strategies. The urge of consciousness to create coherence is so strong that much evidence, both scientific and anecdotal, has shown that when something bizarre or unexpected happens, consciousness just fabricates. It creates fabrications that edit out anomalous information or changes it, so that it fits into a more conventional picture.

What this suggests is that nonconscious cognition has a strong link with creative activity across a realm of fields including literature, music, any of the time-based arts. Why? Because first of all, it is closer to the body and the body's interactions with the world, but also because it is open to highly unexpected and unanticipated events. And it is more likely to register those events

than is consciousness. Consequently, I think it has a very strong role to play in creative activity, including in children, or rather, especially in children.

Mary: There's so much of what you've outlined there that I want to pick up on, because it helps map a trajectory or a way to approach this question of learning. And I think one of the things that you've said there about the nonconscious and its close relationship to the world and the body — feels almost similar to Henri Bergson's idea of intuition — but I don't think that's what you are saying, however nonconscious cognition opens out a different series of understandings of the world and our engagement with it.

And there's something really wonderful about having to reconsider *thinking* and *cognition* in this way, because what it does do, and your books have been a testament to this, is open out the thinking around the relationship between our bodies and the world, and the world and our bodies. And how technology is a part of this kind of extensivity or extension, if you like, and this relationship. And I'm thinking specifically now of learning too, because almost all the habits that we learn as children or as humans as we grow, our learning processes — and later on we can talk more about how that might eventuate say in a classroom or a curriculum — depend on this relationship. You've pointed out in your book *Unthought* the need to move beyond the anthropomorphism or anthropocentric view of consciousness. I'm wondering if you could reflect on the interplay of this relationship of technologies, bodies, and creativity, and where it might take us...

Katherine: I'm sure you're familiar with those experiments that do things like this. You show a class of kindergarteners how to make a fan by folding paper in opposite directions, and then you give them verbal instructions. And once you give them verbal instructions, even though they knew how to do it previously, they're stymied, and they're not able to complete the task. So, in some way, language, verbal language is interfering with their kinesthetic sense of how you manipulate the paper, how the paper feels, how it has to turn in order to make the fan, and so forth. I don't mean to completely downplay consciousness, because obviously consciousness has tremendous evolutionary advantages as well. My book and argument is meant more as a corrective to what I see as an over-emphasis throughout centuries of consciousness as the whole of cognition. That's one reason why I prefer to use cognition instead of thinking or thoughts because cognition is for me a broader term.

Mary: Yes, I remember doing these kinds of activities as a child and how frustrating it was because of the dimensions you're speaking about. What I find interesting is that we've all maybe had it at different times where you can feel something and you can do it, but then when language comes in, or you're judged upon it or something, then the correction comes into play, and then you don't know what you're doing. I'm wondering about that correlation, because I think the question of consciousness has also something to do with it, and the questions of agency, responsibilities and so on.

And I what your approach is asking us to consider is more about those co-evolutions or interdependencies in a sense, so that thinking itself is one aspect of a multiple range of processes that need to be really engaged in both socially and politically, and of course, in terms of learning. What I find it intriguing in your work is it's offering us ways to ask the questions, and I don't think you're saying you have the answers, but I think you're saying, look, let's consider this approach to cognition, because it's a necessary function in order to evolve, because right now we have accelerated the whole relationship between the body and technology.

Katherine: Oh yes, definitely. I know if you've read my book *Unthought*, you're familiar with this idea, but I try to define cognition in a way that it applies both to nonhumans and technical media as well as to humans. Here is the minimal definition of cognition that I use in my book: Cognition is a process of interpreting information in contexts that connect it with meaning. According to this definition, all biological lifeforms have cognitive capabilities as they sense information from the environment and respond to it in ways appropriate to their contexts. It is a very deliberate move on my part to try to diminish the anthropocentric idea that only humans can create meaning. I would like to open the possibility of meaning-making practices to all biological life forms, including those without language, and including those without brains. It is a more capacious way to think about how behaviours relate to the environment, and how these behavioural responses can in themselves become meaning-making practices for specific organisms, for example with plants or even microorganisms such as bacteria. It has a broader view of the role of cognition on the planet that tends to deemphasise the role of humans, and put more weight on nonhumans and also on technical media.

I'm trying to create a vocabulary and a conceptual framework that would let us move away from the centuries of tradition that have accreted around concepts such as "thinking", "free will", the "soul", and so forth, and open us to other possibilities. I also want to clarify for us what it means to create technical media with cognitive capabilities, such as computational systems that can sense aspects of the environment, interpret that information, and perform behaviours in response of their interpretations. As these systems become increasingly pervasive and consequential for those of us who live in developed societies, it is essential that we recognise them as entities with cognitive capabilities. As Louise Amoore argues in *Cloud Ethics: Algorithms and the Attributes of Ourselves and Others*, algorithmic systems are ethicopolitical entities capable of interpreting information and making decisions. This has important consequences for our view of humans as the sole entities capable of ethical actions and the sole possessors of free will, capable of making autonomous decisions.

Mary: There's two things I want raise: I think you call it in *Unthought* planetary ecology or wording like that and that's what we need to be considering now. Could I ask you to expand a little bit more on this last point about creative technologies and media relationships because we're talking right now during a period of COVID, and here in Sydney, we've gone back into lockdown, and we've gone back into online learning. The question that I'm circling around goes

back to your early work in *How We Think*, and the point that you raised in that book about the different ways in which we read, for example, the different changes in technological developments have led to changes in our attention spans, changes in the ways that we engage with information and thought production. These changes do not have to necessitate moral judgements, but they certainly register changes in our sociality, our relationships to ourselves, our relationship to others, the ways of thinking about how we learn and so on. And it is how to critically evolve with these changes and how to see the potential or see the creative potential, and I think the nonconscious is a very helpful approach.

So, I want to ask you a bit more about this dimension of changes in cognition, because that's what I'm finding one of the interesting aspects of teaching online is having to find ways to create differently, and drawing on different vocabularies for this experience, because I think the vocabularies we have are quite limited right now (and they can feed into some neo-liberal ideas of the individual choice and free will). You have to invent different ways to approach learning and I think the nonconscious elements of processing have an important role to play in the new dynamics of the classroom ...

Katherine: I'm sure you are more familiar than I am with all of the new techniques that have been developed for distance learning, and the minuses and the pluses of that, as opposed to face-to-face learning and so forth. So, I won't attempt to comment so much on that. But I do think that it's important when we use technology with children, that it not be presented to them as a black box. I think that critical modes of interrogation are essential when you use technology. An example of this for me is the waste can on a Macintosh screen into which you drop files when you're done with them. And now you think that the files have been erased, although in fact something very different has happened; the file has only lost the bits telling the hard drive where it is. I think it's really important to impart information about what is actually happening in the computer. The interface hides it in the interest of making desktop seem more 'intuitive', that is, making it seem to conform to our everyday working environment. The computer is a very special kind of device, and to the extent that's occluded or hidden from children, the effect is pernicious because it's anthropomorphising the computer in a radical way- and it's disguising the various precise ways in which the computer is able to achieve cognition.

I can give you a simple example. One of the tools widely used in the States (I can't speak about Australia) is the iPad. Even kindergarten students are being given iPads. The teacher will typically demonstrate the wow factor, you know, that you tilt the screen and the image changes accordingly and re-orient itself and so forth. Well, I think children should be told why that's so, because it has an accelerometer in it that is able to sense speed of direction and able to orient the image accordingly. So that's just one example where one can actually explain what is really happening and how these effects can be achieved, so that children from an early age begin to understand the fundamental differences between human cognition, computer cognition and non-human biological cognition. And even though I'm using the word "cognition" for all three modes of processing information, I think it's important that the differences be recognised and

treated respectfully in terms that are accurate to what's really going on, not just simply through anthropomorphic fallacies.

Mary: That's interesting because one of the aspects of what you've been writing about as well is the need for dialogue – or rather a correlation between different trajectories of 'thinking': science, arts, humanities, all of those sorts of things speaking to each other, and in a way that is an example of where the different processes help us to understand our relationships, and how we can co-create decision making or understand the processes of decision making, which raises different questions for us... In *How We Think* you looked at the trajectory of the telegraphic message and the way the coding of this communication happened and all the kinds of questions and the developments around that, questions of public and privacy issues and all these sorts of things that have all these huge and big ethical questions for us. So, with the developments in communication, new habits of learning become available or rather we have to 'retrain' or rework our habits, and these changes become a way of understanding how we can create the worlds that we live in. Bearing in mind that our thinking or cognition is different to that of a *rock* or other forms of nonhuman life, and there's something in these processes of respecting and recognising the cognitive differences and ecology of the world that doesn't put us humans at the centre of it ...

Katherine: Yes. Exactly, I'm working on a new book with the working title *Ecological Reciprocity: Human Futures with Our Nonhuman Symbionts*. What I'm trying to do is to take some of the ideas I developed in *Unthought*, and continue them into ethical explorations, and also kind of enlarging the conceptual framework that I was working with there, into other directions ...

Mary: There's a few important issues in terms of what I'm thinking around a future of learning and it's that very nature of the nonconscious in what you're saying about the processes that are going on, the relationship of the conscious mind, and that kind of narrative or the biographical sense, but there is this other thing going on in a way that connects us— for want of a better word — truthfully to the experiences that we're living. And there's something really fundamental in that process, I think, in terms of learning, and how we can orient ourselves. This comes back to the question of teaching in the classroom for a whole span of experiences — I teach in the university classroom, but I think from the very beginning, from a young age, all the way through learning processes this is huge question, that is, how to enhance these understandings so that our bodies become relational to these ways of thinking and learning that can, instead of restrict us, enable us to expand more of our consciousness, the cognitive sense that you are talking about.

I hope that wasn't too long-winded.

Katherine: No, I understand. And it's precisely that idea of relationality that I think is crucial here. I shouldn't speak of Australia, I am of course an American. But the US was a country founded on

the idea of independence, self-will etc., and I wonder if maybe Australia is somewhat similar in that regard.

Mary: Yes. It is.

Katherine: In any event, I think we're beginning to understand the extent to which we are engaged in a symbiotic process with cognitive media, and the ways in which human decision making is now being preconditioned and precalculated by cognitive media. So that it doesn't make sense any longer to think about the individual as the relevant decision-making unit. Yes, the individual has input, but frequently that input is already predicated upon information that's been gathered by computational systems, which have analysed it, processed it through various kinds of sensory filters, and then presented to the human so that it already becomes a collaborative kind of realisation. It is very hard to get that message across in the US because of the tendency in the US to favour individualism and free will. But that's simply the reality of contemporary life. And it's not only a matter of your personal interactions either. It's a matter of the way the entire infrastructure of the society is already permeated by cognitive media.

Any network of any complexity at all, including food, transportation, railways, communication, banking and so forth, is already completely saturated with the operations of cognitive media. It's not only as individuals that we depend on it, but it's as entire societies that we depend upon it. That's why I think it's appropriate to call it a symbiosis because the operations of these machines are now so necessary to the smooth functioning of society that if they were suddenly all to go kaput — the world would be plunged into chaos. In my view, very few humans would survive in that case. So, it's a species issue as well as a societal and an individual issue.

Mary: Yes – a most basic example would be a couple of days ago I was in the middle of an online seminar, and three of my students just disappeared, and it was because there was a power outage in their part of the city. And so that experience inhibited them from participating further in the class and I was unsure what had happened to them... and so there was a certain sense of the fragility around connectivity. I'm going on the tail end of what you're saying about how those interconnections are really embedded in how we live now. And the question, which I think your books are always asking and in a way what I'm trying to think about, is the possibility or the creativity in all of this is: how do we manage it and what are the ways in thinking about curriculum or classrooms. The bigger question, too, are the kinds of ethical responsibilities that we are now facing when you have to take these computational processes into account. And I'm just wondering what your thoughts are about that -

Katherine: I don't know if you've had a chance to look at Louise Amoore's book, *Cloud Ethics*, that I mentioned earlier? It's about how one thinks about ethics in the age of algorithms. One of the questions she asks is precisely about responsibility. She's British and living in a society where surveillance cameras are everywhere. She says, okay, so suppose I'm in a demonstration and my

image is picked up by a surveillance camera, and this enters a database, which is then later used to arrest somebody, what is my responsibility there? And of course, for most people, the connection between her responsibility for being in the street protest would be so tenuous to whatever application that database is finally used for as to be negligible. She suggests that what's happening is a very large-scale transformation — to put it in technical terms — in which correlation is being substituted for causality.

Mary: Oh yes. I understand that.

Katherine: When you have large scale databases, algorithms are used to find correlations between various elements. Chris Anderson, the editor of *Wired* Magazine, has famously argued that we don't need causality anymore because we have these massive ways of calculating correlations. Personally, my own feeling is that no scientist would agree to that proposition, because when you have correlation, all you know is that things happen in synchronicity. You don't know what the relations between those elements actually are. So, it's a way of occluding actual causal connections, and hence making it much more difficult to attribute any kind of responsibility because you're operating on correlation rather than causality. Amoore's argument in effect is that this is highly corrosive of even the possibility of an ethics, so she counters it by arguing that algorithms always already function as ethico-political entities. Even to be able to think of an ethics, you can't stop with correlation. You have to find some way of actually determining and attributing responsibility. In addition, she also wants to blast open the apparent certitude of an algorithmic result, which conceals all the probabilistic decisions that went into the result, thus reinstating the possibility of doubt and alternative outcomes.

Mary: That becomes a really essential issue and you've often looked at science fiction as a way of unpacking some of the intersections between correlation and causality. And my question around this is the function of fabulation — which is part of our relationship to the world, and which enables us to tell certain kinds of stories or ways of comprehending the correlations — but the main problem occurs when certain stories dominate the correlations, in other words, there's only certain fabulations that become the truth of what the world is ...

Katherine: Yes. Right. And of course, we here in the US are being swamped by conspiracy fever theories of all kinds, such as QAnon, and all the others circulating in the dark recesses of the internet. We're really experiencing the way that these can damage democratic processes. And democratic processes do depend on a basic agreement on facts, a basic agreement on causal relationships and so forth. When those are being trashed every day on social media and ridiculous kind of theories are circulating, it becomes extremely difficult for democracies to even sustain themselves.

Mary: Yes. I'm thinking of the future. I'm thinking of the symbiotic relationship that you're talking about, and I'm thinking about how do we make sense of all of this for ourselves as a species and what sort of new habits of learning do we need? That's a big question, I'm sorry ...!

Katherine: It's obviously a huge question. Again, I would return to the importance of having widespread technical knowledge that begins at an early age about our symbiotic partners now who are so much a part of our lives. And not just being content with the interfaces that corporations create for us but have a deeper understanding of what actually is going on. And the more that kind of actual information can circulate in the society, I think, the better off we'll be. And perhaps the more resistant to these ridiculous theories that are circulating... I'm not sure what attracts people to these, but it's really reached the point of alarm.

Mary: Definitely. What we've been addressing are some of the ethical issues at stake for us, and this is an important question to think through at this point in history where we are at tipping scales of planetary ecologies but also how we learn ...

Katherine: I'd like to pick up on one other thing earlier in our conversation. One of the things that interests me as a literary scholar is how literature can contribute to these processes that we've been talking about. So, I'll begin with a wonderful observation by Garrett Stewart, who's a very sophisticated literary critic. In his book *Reading Voices*, he asks the question, not what we read, but where we read. And he argues that we read in the body. If you ask a related question, what makes literary language literary, his answer is that language is literary because it has found a way to pack excess meanings into the verbal formulations that it uses. And it does this through embodied practises that are activated only through embodied practises like subvocalisation.

In his latest book, *Book Text Medium: Cross Sectional Reading for a Digital Age* (2020), he gives a wonderful, quick example using Adrienne Rich's poem, 'To a Poet'. The poem is about the tragic split between being an aspiring poet but having young children to mind and all of the mundane duties of housework that constantly intervene and distract, and the kind split in identity that occurs when one is both a woman and a poet. The first line of that poem is a scene with the woman going out to her driveway; she lives in a winter climate and she's trying to get the ice off her driveway. So, the first line goes: 'ice splits, the metal shovel...', and then it goes on to describe the scene. What Garrett points out is that 'ice splits' has a homophonic variant, '/splits'. There's an extra meaning that's activated when you subvocalise that phrase, 'Ice splits' (or read it aloud). You don't hear it if you don't subvocalise, because on the page your eye just reads the word, and you don't catch the extra meaning. That extra meaning is actually the poem in miniature, and it's a great example of how literary language is supercharged with excess possibilities activated when we read, as Stewart puts it, 'in our body'.

Actually, we can think of these bodily-activated meanings as conduits that connect nonconscious cognition, which is primarily nonverbal and primarily concerned with synthesising and interpreting sensory information, with the verbal capabilities of consciousness.

Mary: That's a superb example. I think that the processing of noncognition plays a vital role for a future of learning, this embodied relationship and making meaning of the correlations of experience, if that makes sense, that is, both conscious and nonconscious are essential, because it helps to move away from the centeredness of the human and opens out to a sensibility that touches the body and its experience. You can feel Adrienne Rich's dilemma, her pain, her quandary ... because it's taking us beyond the structure of language, or rather it makes sense of language and really 'knowing' an experience.

Katherine: I've just been working on an essay on Kathy Acker and non-conscious cognition.

Mary: Ah, interesting.

Katherine: And I don't know how well you know Acker's work?

Mary: I know her work quite well.

Katherine: So, you know that one of her literary strategies is to appropriate very well-known male texts such as *Don Quixote* and *Great Expectations*, in *Blood and Guts in High School* she also works with *Hawthorne's The Scarlet Letter*. Typically, what she'll do is to present the reader with a kind of third grade synopsis that simply recapitulates the plot. In omitting all the literary language, she highlights the difference between *knowing about* a book and *reading* a book. If you read the book, then you encounter firsthand all those literary strategies that make your reading resonant with affect and increased understanding. When you reduce the text to a bald summary, what you're doing is taking only the conceptual material that consciousness would focus on, stripping away all the effective resonances that nonconscious cognition adds to it. When you read one of these plot summaries, you're shocked by it. *Yes, I found myself thinking, it's accurate, and in another sense, it's totally and wildly inaccurate.*

Mary: That makes a lot of sense too. And I just want to come back to what you were saying about how fabulation can go dangerously awry, whether it be by conspiracy theories of COVID-19 or whatever. I'm thinking now and I'm making a hunch here, that the danger has to do with that inability in a way to have that 'knowing' in the sense of the nonconscious. In other words, there's not enough space given to recognise the dimensions of nonconscious experience and that we are part of a system. And if there's more of a *feel* for the nonconscious, it could potentially limit the conscious tipping into fear and panic, which is the tip of iceberg of the real experience or encounters we have in the world, and which produces dominant truths and language. So, it's something about this interchange that offers opportunities to consider new ways to develop meaningful practices whether it be in the classroom or in everyday life choices, and I think both

the examples you've given are good examples, very concrete examples of this interplay of understanding different layers and levels of experience.

To end, I think the nonconscious is a vital way of approaching learning for educators, scholars, and practitioners because it can help attend to some of the limits and possibilities of technological experience, and it provides some new tools to explore the potential for creativity that might help us take more care for a future that is already here: the processing and co-evolving of cognition through our diverse life forms and ecologies.

Author Biographies

N. Katherine Hayles is a Distinguished Research Professor at the University of California, Los Angeles, and the James B. Duke Professor Emerita from Duke University. Her research focuses on the relations of literature, science, and technology in the 20th and 21st centuries. Her twelve print books include *Postprint: Books and Becoming Computational* (Columbia, 2021), *Unthought: The Power of the Cognitive Nonconscious* (Univ. of Chicago Press, 2017) and *How We Think: Digital Media and Contemporary Technogenesis* (Univ. of Chicago Press 2015), in addition to over 100 peer-reviewed articles. Her books have won several prizes, including The Rene Wellek Award for the Best Book in Literary Theory for *How We Became Posthuman: Virtual Bodies in Literature, Cybernetics and Informatics*, and the Suzanne Langer Award for *Writing Machines*. She has been recognized by many fellowships and awards, including two NEH Fellowships, a Guggenheim, a Rockefeller Residential Fellowship at Bellagio, and two University of California Presidential Research Fellowships. She is a member of the American Academy of Arts and Sciences. She is currently at work on *Technosymbiosis: Futures of the Human*.

M. Zournazi is an Australian film maker, author and cultural philosopher. Her multi-awarding winning documentary *Dogs of Democracy* (2017) was screened worldwide. Her most recent documentary film, *My Rembetika Blues* is a film about love, life and Greek music. She is the author of several books including *Keywords to War – reviving language in age of terror*, *Hope - New Philosophies for Change*, *Inventing Peace* with the German filmmaker Wim Wenders and most recently *Justice and Love* with Rowan Williams.

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