Maria Hynes *School of Sociology/ Australian National University*

**Interdisciplinarity, Art and Immaterial Labour in the Creative Economy: Maurizio Lazzarato and the production of value in ArtScience practice**

**Introduction**

In the same year that Pierre Bourdieu’s (1996) *The Rules of Art* was published in English, Maurizio Lazzarato’s essay, ‘Immaterial Labour’ was published in a collection of Radical Italian thought (Virno & Hardt 1996), with very different implications for the analysis of cultural production. While Bourdieu’s warnings about the threat to the autonomy of art posed by market imperatives have been cited innumerable times in sociological journals, engagement with the implications of Lazzarato’s essay for the analysis of artistic production has been relatively minimal. Yet, Lazzarato’s (1996: 133) outline of ‘the new forms of the organization of work’ in post-Fordist societies was exceptionally prescient for understanding the character of contemporary artistic practice. His essay on immaterial labour anticipated many of the broad social and cultural transformations that would ultimately render art unrecognisable from a modernist perspective. In any case, art today is no longer ‘the very paradigm of freedom, heterogeneity, difference and deviance’ that it was for the moderns (Lazzarato 2008: 26). Rather, it is one operator among others in a generalised valorisation of creativity, invention, and innovation. As Raunig et al (2011: 1) note, ‘old notions of art and “the artistic” are being replaced, even as they are absorbed, by the new concepts of creativity and creative industry.’

Within this context, there has been a profound transformation in artistic practice; namely, that it is no longer the modernist ideal of disinterested experience that underpins most artistic practice, but usefulness. The reinvention of artists as potential partners in innovative interdisciplinary endeavours is exemplary in this respect. That there exists an interdisciplinary field by the name of ‘ArtScience’ is testament to art’s newly useful character.1 In such fields of practice, the material production of the work of art is an increasingly minor element of artistic labour, which is more commonly immaterial in character – which is to say, engaged in inventing and communicating ideas, offering creative solutions to problems, and generating new domains of value production. This paper explores artistic practice at the intersection of art and science, arguing that the theory of immaterial labour gains new relevance with the emergence of novel fields of interdisciplinary practice.

The intervention of the Radical Italian theorists of the post-Operaismo school consists in their account of the mechanisms by which, in the post-Fordist stage of capitalism, the whole social field becomes implicated in the production of value. Immaterial labour renders common social capacities (thought, communication, emotion, a capacity for co-operation and so on) as value-productive capacities (Lazzarato 2011). While sociologists have paid ample attention to the practices of self-management involved in the production of the ‘entrepreneurial subject’ (Scharff 2016), what is important about theories of immaterial labour is the stress they place on the centrality of *collective forms of subjectivity* and *processes of productive co-operation* to post-Fordist capitalism. At any rate, neither the modernist paradigm of artistic production, nor disciplinary theories of the neoliberal self, account for the derivation of value from the co-operative sociality of ArtScience encounters. As Barry et al (2008: 30) note, ArtScience is a practice in which ‘cross-disciplinary collaboration is idealized as a value in itself’. Value is only secondarily realised in the commodity form of the artistic product, and primarily derived from the generation of productive co-operation.

The aim of the paper, then, is to use the idea of immaterial labour to shed light on emerging forms of interdisciplinary artistic practice at the nexus of art and science. In doing so, I contribute to critical sociological efforts to analyse the changing terrain of creative culture in the face of a generalised economic demand for creativity (Hesmondhalgh & Baker 2010;Conor et al 2015; Boltanski and Chiapello 2005; Brook 2013; Casey & O’Brien 2020). Sociological inroads into the changes taking place in the field of artistic production have been especially evident in studies of the cultural industries (Hesmondhalgh 2019; Hesmondhalgh & Baker 2010), DIY creativity and hobbyists (Threadgold 2018; Bennett 2018), and forms of ‘aesthetic labour’ (Kardelis 2022; Vonk 2021; Elias et al 2017). The paper builds on such debates, while also contributing to sociological engagement with the idea of immaterial labour (Farrugia 2019; Coffey et al 2018; Gielen 2009; Gill & Pratt 2008; Jarrett 2003). Where sociological engagement with the idea of immaterial labour has tended to draw on the work of Michael Hardt and Antonio Negri (Coffey et al 2018; Gill & Pratt 2008), Lazzarato’s essay addresses directly the economic value of processes of subjectivation in those fields of cultural practice in which collaboration and communication are crucial. In approaching ArtScience interdisciplinarity, then, it is on Lazzarato’s insights that this paper focuses.

That artists are increasingly engaged in forms of labour characteristic of post-Fordist economies has been convincingly established through diverse empirical studies. Especially notable is the sociologist Pascal Gielen’s (2009) extensive qualitative research on artistic practice across Europe and the fascinating analysis he offers, informed by Radical Italian theorists such as Hardt and Negri, Lazzarato and others. In approaching the phenomenon of emerging interdisciplinary practice, I agree with Gielen (2016: 1) that what is needed is not more empirical data on ‘what is happening’, but more ‘speculative thinking on *what can happen*.’ This is especially important when analysing a social reality such as ArtScience, which explicitly positions itself as operating speculatively to bring new futures into being (Lee 2021). Gielen (2016: 1) describes his own practice as ‘theory-based empirical research, which at times also uses empirical findings to theorise in a speculative and subjective way.’ It is this approach that I take in the paper, with an eye to providing insight into the texture of emergent realities in a rapidly mutating context, rather than with the aim of discerning patterns in existing reality. The two cases of ArtScience practice in Berlin that I discuss below are not meant as representatives of an existing reality, but as a way to plug into the ‘liveness’ of practice (Michael 2012)**.** Beforeintroducing the cases, however, I shall briefly discuss, by way of context, the broader social and cultural transformations shaping what has come to be known as the ‘creative economy’ across the world and indicate, in general terms, what Lazzarato contributes to apprehending them.

**Immaterial Labour in the Creative Economy**

When it first appeared in popular discourse approximately two decades ago, the idea of the ‘creative industries’ designated a broad range of activities that ‘depended on the creative talent of individuals and on the generation of intellectual property’, across what could only vaguely be seen to constitute a sector (Newbigin ud). The growing tendency in recent years to speak of the ‘creative economy’ represents the fact that creative labour is now distributed across the social field and with only a superficial regard for sectorial divisions (Newbigin ud).

For critical theorists, the ubiquitous and cross-sectorial nature of ‘creative’ activity represents the homogenization of forms of production along the lines of: the valorisation of cognitive and communicative competences (Virno 2007), the flexibilization and precarization of labour (Foti 2005), the disembedding of individuals from employment in large scale social institutions (McRobbie 2007), the development of digital networks (Terranova 2004), and an increasing focus on the economic impact of creativity (particularly in over-developed societies) in the last three to four decades, with the rise of the so called ‘creative class’ (Florida 2003). What is clear is that, in the generalised turn to creativity as a source of value productive activity, the meaning and status of the field of artisticproduction is transforming rapidly and profoundly.

Lazzarato begins his essay with an apparently straightforward definition of immaterial labour as the ‘labor that produces the informational and cultural content of the commodity.’ Work is increasingly organized, firstly, according to ‘skills involving cybernetics and computer control’ (Lazzarato 1996). At the same time, forms of labour not previously recognised as work become more significant, including ‘activities involved in defining and fixing cultural and artistic standards, fashions, tastes, consumer norms, and, more strategically, public opinion’ (Lazzarato 1996: 133).

What many readers and critics of Lazzarato miss, however, is the extent to which he develops the idea of immaterial labour beyond the seeming simplicity of this starting definition. Lazzarato indicates that the transformations in the sphere of labour go far deeper than the creation of new forms of (paid or unpaid) work, within the paradigm of commodity capitalism. Rather, they involve a fundamental refiguration of the opposition between production and consumption, between work and leisure time, labourer and labour market, and mental and manual labour. For instance, manual labour – including that carried out in the factories now largely sited in the developing world – becomes increasingly informational and thus mental and intellectual, requiring ‘subjectivities that are rich in knowledge’ (Lazzarato 1996: 134). The point is not simply that privileged subjectivities flourish in an economy oriented to the saleable production of goods and services. Rather, it is that in this phase of capitalism, *processes of* *subjectivation* are at the centre of value production*.* As David Farrugia (2018: 515) notes, immaterial labour is ‘an intensification of the call to “become subjects” through work.’

Lazzarato (1996: 135) emphasises that this call is paradigmatically expressed in the ‘mandate to “become subjects of communication.”’ The challenge to capitalism in this post-industrial phase is to impose the process of valorisation on ideas, images, social relations and activities that were formerly considered mere dimensions of the life process, to circulate and propagate their value. No longer the other of labour, creativity becomes crucial to the labour process. More specifically, the *communication* of creative value ensures that productive cooperation is reproduced, and that value flows from and through the social field. *Collaboration*, for its part, translates sociality into value-productive sociality, and thus ensures that the social relation is reproduced as a capital relation. To put it into the language of contemporary business, collaboration ‘pulls together larger numbers of diversified and talented individuals to more and more rapidly innovate and drive new levels of performance on a continuing basis’ (Gleeson 2013: np). Even DIY cultural scenes become DIT (Do it Together) ones (see Threadgold 2018), as resistant forms of sociality become appropriated toward the capital relation.

I want to stress at this point that communication and collaboration are not mere means for the circulation of goods and services, as they were in commodity capitalism. What distinguishes the current phase of capitalism is the fact that the principal product of the cycle of immaterial labour is *a productive form of the social relation*. And for this, communication and collaboration are fundamental. As Lazzarato (1996: 145) insists, what is productive in the cycle of immaterial labour is ‘the whole of the social relation’; thus, it is ‘the forms of life (in their collective and cooperative forms)’ that ‘are now the source of innovation’ (Lazzarato 1996: 145). Consequently, both the product and ‘the "raw material" of immaterial labor is subjectivity and the "ideological" environment in which this subjectivity lives and reproduces’ (Lazzarato 1996: 142).

It is within this context that the currency of interdisciplinary practice today might be understood. The very existence of an endeavour such as ArtScience depends upon the ingenuity with which collaboration and communication across disciplinary boundaries are negotiated. For proponents of STEAM, art’s unique mode of addressing material problems has the potential to contribute to impactful, perhaps patented, research (Costantino 2017). In such contexts, art is seen as a way of adding value to analytical forms of thinking, which are considered less adaptable to flexible and non-linear processes of value production (Schnugg & Song 2020). Celebrated forms of ArtScience are thus recognised as cutting edge contributors to knowledge and innovation economies; an obvious example here would be the so-called ‘world’s coolest innovation lab’, the MIT Media Lab, where the synergies of science and art are put toward solving the big problems and ‘creating the most wondrous marvels of our era’ (Wilson 2021: np). In contrast, an ArtScience institution such as Australia’s SymbioticA has carved out a reputation for a more critical engagement between art and science, through its uniquely experimental and experiential form of artistic inquiry (Catts & Urr 2018).

Beyond these well-known examples of ArtScience, is a diversity of emerging artistic practices, involving day-to-day negotiation of relationships with scientific knowledges and practitioners. In their 2008 study of ‘logics of interdisciplinarity’, Barry et al (2008: 38) refer to ArtScience as ‘an emergent field’, insofar as ‘there is a ferment of activity but as yet little codification; practice runs ahead of theory.’ I suggest that the same could be said of this form of practice in 2022, not because the field has failed to ‘progress’, but because its development as a field is not of a strictly linear nature, given that it isboth practice-based and speculative in its orientation to possible futures. While art may be positioned in funding and policy contexts as a way of communicating science or ‘publicizing and enhancing the aesthetic aspects of scientific imagery’, the reality is somewhat difference in what Barry et al (2008: 29) call the ‘microsocial space of interdisciplinary practice,’ where ‘scientists sometimes adopt a service role for artist collaborators, providing resources and equipment to further a project conceived largely in artistic terms.’

It is with an eye to the ‘microsocial space’ of practice that the cases below function. They provide a glimpse into the adaptative forms of artistic labour in practices with a distinctly emergent and speculative character. The selected case studies involve (i) an artist and academic, who is the founder of an Art and Science network to formalise research connections between artists and science; and (ii) an individual artist connecting with scientists to inform and provide material for her individual and collective practice. Both case studies involve artists in Berlin, a city often referred to, no doubt with more than a touch of Eurocentrism, as the ‘creative capital of the world’ (Dhillon 2017). It should be stressed that my interest is not in generality, but in the specificity of their unique practice; understanding that they were being considered as ArtScience practitioners in their own right, rather than representatives of a population, both artists chose to be identified. While our discussions were recorded to assist in the retention of key details, the conversations themselves had a natural, contextual flow, as we moved around their homes together discussing the processes of interdisciplinary creativity in which they were involved (see Sharpe 2009)**.** In view of the speculative character of the practices in which these artists are engaged, the discussion below is meant to have a performative function, drawing on Lazzarato’s ideas of immaterial labour to contribute to a critical unfolding of the still emergent reality of ‘ArtScience.’

**Nodes and Networks: Communicative Labour, Innovative Practice at the Art & Science Node.**

Berlin is a city of hubs and nodes. The driving ethos behind these relatively informal institutions involves the collective sharing of ideas via ‘voluntary, self-directed action’ (Toivonen & Friederici 2015). Relative to the larger and obviously entrepreneurial innovation nodes throughout Berlin, the Art & Science Node in Berlin is a more organic network of researchers and practitioners. The founder and Chair of the Art & Science Node, Professor Joanna Hoffmann, is an artist, researcher and curator, whose artistic work is principally in multi-media installation and experimental video animation. Hoffmann is also a Professor at the University of Arts in Poznan, where she established and leads the Studio for Transdisciplinary Projects and Research. The Studio provides a unique opportunity for students of art education to collaborate with scientists, and specifically biologists, on research projects of mutual interest. Such projects may also serve as a route to biotechnological solutions to the management and democratisation of resources.

At more than one point in our conversation, Hoffmann referred to the fact that intellectuals today are ‘now mostly managers.’2 This recalls Lazzarato’s (1996: 134) claim that, in the phase of immaterial labour, intellectuals become increasingly involved in developing ‘the capacity to activate and manage productive co-operation,’ from grant teams to networks to interdisciplinarity. Innovation is crucial in this phase, and Lazzarato (1996: 134) notes that:

We arrive at a point where a collective learning process becomes the heart of productivity, because it is no longer a matter of finding different ways of composing or organizing already existing job functions, but of looking for new ones.

This capacity to activate and manage productive co-operation is strongly evident in Hoffmann’s establishment of the Art & Science Node (hereafter ASN) in Berlin. An evolving network of artists, scientists, and biotech practitioners, the ASN is, to quote from the webpage, ‘a creative & innovative network aiming at and committed to the creation of the synergy between Art, Science and Technology’ (www.artconnect.com). Again, the exchange of perspectives between artists and scientists is central, but the node serves less as a means of formalising research outputs than as a way of co-ordinating events that communicate innovation more ‘freely’, as Hoffmann put it, than university structures allow. She spoke of the node as a ‘platform’ for shared knowledge and discussed its role in keeping the networks and flows of ideas, people, and labour circulating. Among the interests of the group that Hoffman discussed, were projects to make visually perceptible otherwise imperceptible molecular phenomena; artistic explorations into the implications of progress in genetic science for human identity; art-science research into plant networks and Hoffman’s own immersive and interactive digital art projects. In each of these diverse projects, the focus is on creating productive synergies between artistic, scientific and technological perspectives.

Hoffmann is aware that the network’s activities take place in a broader social context in which, as she put it, ‘managing knowledge is one of the biggest problems for the 21st century.’ Alongside this management of knowledge is the less visible but crucial management of social cooperation. As Lazzarato (1996: 136) insists, the organization of the cycle of production of immaterial labour ‘constitutes itself in forms that are immediately collective’ and ‘exists in the forms of networks and flows.’ The managerial capacities involved within the organization of the cycle of immaterial production are not always ‘apparent to the eye’, precisely because of their co-operative form, and the ‘factoryist’ assumption that management entails visible authority (Lazzarato 1996: 136). Nonetheless, ‘the quality of this kind of labor power’ is defined ‘not only by its professional capacities… but also by its ability to "manage" its own activity and act as the coordinator of the immaterial labor of others’ (Lazzarato 1996: 136).

In this case, Hoffman’s own professional and managerial capacities are supplemented by a somewhat transient body of people (often young and largely international), who bring their expertise to the network for variable durations of time. Hoffmann commented that many of those who devote their energies to organise events through ASN are highly qualified, often with double degrees in disciplines as diverse as visual arts, anthropology, engineering, nuclear physics, and biotechnology. While Hoffmann clearly plays a crucial role in co-ordinating the activities of these diverse individuals, the self-organising capacities of the network are also notable.

‘My working hypothesis,’ writes Lazzarato (1996: 137)**,** ‘is that the cycle of immaterial labor takes as its starting point a social labour power that is independent and able to organize both its own work and its relations with business entities.’ In this respect, it is significant that when asked about the funding support for ASN activities, Hoffmann indicated that ‘all the work is based on a voluntary basis, so the funds come with the project and also through the partners.’ It was, she suggests, central to the concept of ASN that it not be ‘dependent on, for example, city funding or anything like that’, the preference being, rather, for ‘engaged partners’, such as ‘research institutions, art institutions and different institutions which are also related to innovation.’ Hoffmann noted that they had developed a ‘very good relation with the German Patent Office’ in Berlin, which has connections with the European Patent Office. The Patent Office contributes funds to what she described as mutually beneficial ‘PR events’, such as the Lange Nacht der Wissenschaften (Long Night of Science). Funds cover the costs of exhibitions, along with insurance, but unfortunately do not cover the labour of those who organise the events. Hoffmann makes it clear to those keen to be involved that the events are not meant as a gallery space, so much as ‘an opportunity for artists and scientists to exchange ideas’, and she spoke enthusiastically about the engaged (largely young) people, who devote their energies to the network’s events because of their ‘passion and interest’ for art and science.

I was fortunate to attend the Long Night of Science at the German Patent Office and to observe the kinds of communication and knowledge exchanges that the ASN facilitated. Apart from the copious labour that had evidently gone into the organisation of the event, members of the network were engaged in communicative labour on the night. More precisely, members of the network dedicated significant labour toward making the knowledge that was being communicated, often via interactive artworks, *interesting*.

As Sianne Ngai (2012) suggests, with the increasing convergence between art and the exchange of information, ‘the interesting’ has become an aesthetic value in its own right, displacing more classical aesthetic categories, such as the beautiful and the sublime. The interesting serves to mediate between feelings and concepts, enabling us to move from an emotional to a cognitive register (Ngai 2012). It thus, in an ‘aleatory and subtle’ manner, assists in immaterial labour’s task of producing continual innovation (Coté and Pybus 2007: 103). What is crucial to this phase of capitalism is continual innovation ‘in the forms and conditions of communication’ themselves (Lazzarato 1996: 137). And what is being produced at this level are needs, desires, the imaginary, new ways of seeing and knowing. As Lazzarato (1996: 144) suggests, ‘(n)ew modes of seeing and knowing demand new technologies, and new technologies demand new forms of seeing and knowing.’

Art’s role in the production of these ‘new ways of seeing’ is being widely recognised across the globe. As indicated on the ASN website, ‘Art & Innovation events deal with the spirit of our times’, responding to the challenge of enabling ‘communication between various milieus’, which is so crucial to ‘interdisciplinary knowledge exchange and development of the society of knowledge’ (artscience-node.com). Hoffmann astutely contextualises the work of ASN within a broader European recognition that ‘knowledge is the only goal we have; we have no other resources.’ It is not surprising, then, that art and innovation events involve a substantial investment of immaterial labour to render knowledge interesting and thus valuable.

In achieving such a task, affective labour is also vital, as was evident at the Long Night of Science. In speaking here of affective labour, I do not primarily intend to refer to the context-specific emotional management famously described by Arlie Hochschild (1983). Lazzarato does not operate with the distinction between authentic and performed feelings that structures Hochschild’s work. Affective labour is not simply a question of inducing or suppressing one’s feelings to align with the requirements of the workplace (cf. Hesmondhalgh & Baker 2010). Affective labour describes, rather, the status of feeling in the phase of capitalism in which the product, ‘ultimately, is us’ (Massumi 2002: 20). Immaterial labour ‘produces first and foremost a “social relationship” (Lazzarato 1996: 137) and its affective dimension lies in the production of subjects who ‘naturally’ feel in certain ways. The affective labour evident at the Long Night – most notable in the form of enthusiasm – was clearly not required as a condition of employment. The enthusiasm for the possible synergies between art and science was real; it was not a question of emotional labourers paid to suppress their natural feelings, but of people for whom an enthusiasm for art-science encounters was inextricably tied up with a sense of their own purpose and value. As voluntary labourers, those involved in the event exhibited a passion for the ideas, which was no doubt felt, but also an effect of the increasing inseparability of life and work described by Lazzarato.

In short, it was evident that the immaterial labour in which members of the network were engaged (affective, cognitive, informational, communicative, and collaborative) served the personal desires of the participants to advance interdisciplinary endeavours about which they felt passionate. It also served their more pragmatic needs, such as gaining experience (in the case of the largely precarious volunteers) or demonstrating public impact (in Hoffman’s case). But the same immaterial labour also served the needs of neoliberal capitalism, delivering interesting and valuable knowledge to the public, partaking in processes of valorisation crucial to the functioning and reproduction of the knowledge economy, and so on. The point is, as Lazzarato (1996) insists, that the desires and needs of people and those of the economy are increasingly aligned through immaterial labour. This is, in large part, because what this phase of capitalism produces are modes of subjectivation favourable to the reproduction of capitalism.

Innovation is the catch cry of this phase of capitalist development and, as such, valorisation processes are profoundly variable; what counts as innovative from moment-to-moment varies alongside the seemingly infinite production of desire and need. As Cote and Pye (2007: 103) suggest, ‘it is the variability of possible valorization processes that holds the secret abodes of surplus value for capital.’ How is this variability lived in daily life? As the second case illustrates, for an independent artist pursuing collaborative and curatorial opportunities with scientists, resourcefulness, timeliness, and adaptability in the face of fortuity are the order of the day. The entanglement of economic and subjective processes takes on a specific character under precarious conditions (Lazzarato 2011). Here too, artistic creativity, but also inventiveness in forming connections, gaining knowledge, and communicating value, are crucial elements of an artistic process that produces much more than a cultural artifact. Not least among these productions is ‘the artist.’ Without the security that institutional tenure provides, the subject here functions as a kind of pure potentiality within the production of value, responsible for her own motivation in a collective learning process that requires cooperation and collective coordination.

**The Precarious Collaborator: Opportunistic Encounters Between Art and Science.**

Without the kind of institutional base that Hoffmann’s university position provides, Berlin based artist mp (Mary Patricia) Warming spends a good deal of her time as a somewhat precarious labourer making and nurturing connections. In her description of herself as an ‘artist-curator,’ Warming indicates the extent to which her labour involves a combination of individual artistic practice, collaboration, and collection. Warming works within, but also plays with, the conventions of natural history representation. In addition to her drawing-based work, Warming has produced performance pieces, but principally regards herself as a collector, who seeks to engage art and science in creative, and often collaborative, interventions. One such example is the independent venture, ‘Art Science Exhibits’, which Warming founded back in 2016, which curates ‘exhibitions and public programs’ involving artists and scientists, with an aim of enhancing ‘the sphere of art/science conversation’ toward the ‘future of nature-kind’ (artscienceexhibits.com). As her reflections on co-evolutionary aesthetics indicated, collaborative practice is, for Warming, a process ‘of experimenting with new forms of aesthetic agency,’ to which biotic and human arts alike contribute. Warming sees herself as someone who ‘sets things in motion’ and, for all the modesty she displays in person, she has been extraordinarily successful at doing just this.

My conversation with Warming covered fascinating ground, but what interests me particularly here are the diverse forms of immaterial labour, creativity, and ingenuity involved in engaging in interdisciplinary art practice under somewhat precarious conditions. Much of Warming’s labour involves her in forms of activity that are typical of what Lazzarato (1996) calls ‘mass intellectuality’, including research in relevant areas of knowledge, entrepreneurship in cultural politics, self-skilling in informational and technological domains, the shaping of cultural and artistic tastes, and so on. As Lazzarato notes, this intellectual labour engages one in forms of practice that were once considered the domain of an intellectual elite, and others that would traditionally not have been considered ‘work’ at all. In addition to the research that informs her engagement with science, grant applications and the curation of ArtScience exhibits, Warming puts extensive labour into connecting with scientists, curators of natural history museums, libraries, and the like. At one point, Warming commented that ‘about once every three months, if I’m lucky, I’ll get to do some art.’ Later, when she showed me one of her beautiful compositions, I asked roughly how long it would take her to make such a piece. Laughing, she replied, ‘well what do you mean?... like, the physical thing?... the actual drawing?... that takes about two days!… but the research for it… well, you know, I had to go to the American Museum of Natural History and connect with all those people, then there’s negotiating access to the images, getting access to the scanner to get the images at the highest resolution … you know?’

In any case, it was evident that this immaterial labour of pursuing ideas and social connections was at least as important as the material labour involved in the process of artistic production. As I have indicated, Lazzarato’s (1996: 133) references to ‘the cultural and informational dimension of the commodity’ do not simply refer to the intellectual and informational labour involved in the production of a material thing, nor the marketing and advertising that makes it saleable as a commodity. When one of the primary commodities produced by post-industrial capitalism is subjectivity, the whole social process becomes a ‘dimension’ of the production. It is within this context that Warming’s description of herself as an artist who is ‘essentially interested in process’ needs to be understood. As she was keen to emphasize, it is not the concept behind a given work or collection that is important to her (‘I’m just not that kind of artist!’) but the process, and this process extends into the social field at large. Warming’s ideas are ways of setting into motion collective processes of subjectivation, which will, she hopes, point existing formations towards more possible futures.

To give an example, much of Warming’s labour at the time we met was directed toward a fascinating project designed for the Reichstag Dome, the ‘Evolutionary Spiral.’ Warming’s vision for the dome features eighteen white flags, each bearing a drawing of the ear of an inspirational scientist or scholar, to playfully refigure Norman Foster’s design of the dome as a symbol for democracy through the evolution of new practices of interdisciplinary communication, and specifically listening. The vision has been partially realised in an installation displaying images of the ears of prominent scientists at the Humboldt University in Berlin (www.artscienceexhibits). However, it is not primarily the realisation of the concept that interests me here. Rather, my interest lies in the immaterial labour involved in deriving value from the process of production: the social, and specifically communicative, labour involved in putting the idea into motion, the value generated through the collaborations it involves and the modes of subjectivation produced through the pursuit of the vision.

As an artist engaged in processes of collaboration and curation, Warming’s livelihood rests on the ability to create and finesse opportunities, and she spoke at length about the opportunistic processes through which she had pursued the vision of the Evolutionary Spiral project. On her way to the Venice Biennale, she goes to the opera ‘with a friend of a friend who was the director of the library there’ and this gives rise to an invitation, which in turn leads to her meeting ‘Foster’s managing architect in Berlin’, through whom she eventually gains access to the plans for the Reichstag and meets his friend who is the Reichstag’s curator… and so on. Then there are the years spent ‘building connections and projects with various scientists.’ Warming has been necessarily opportunistic in her interdisciplinary practice, though by this I certainly do not mean to indicate that she is instrumental or self-serving in her dealings with others. Her genuinely collaborative practice is motivated by a sense that fields such as collective animal behaviour and biodiversity can aid in the production of the kinds of novel forms of collective life that she sees as crucial to the future.

I use the term ‘opportunistic’ here in a more ecological sense, to refer to the processes by which life establishes itself in previously unexploited habitats and, in this, Warming has shown real inventiveness.

Opportunism, then, is not a subjective attitude so much as an objective dimension of immaterial labour, related to the indeterminate character of the process of valorisation. What will constitute value-forming labour cannot be determined in advance of processes of communication and connection, which are themselves variable, contingent, and productive. Warming spoke of her dedication to researching the projects she pursues (‘I wanted to do it in in a way where I could learn, because it’s a process for me… I’m giving my life to it…’). Yet the projects she pursues, and the scientific ideas that inspire them, tend to emerge somewhat opportunistically. When I questioned her about her interest in nanoscience, for example, she said that she got to it ‘in a sort of serpentine way, trying to find the next science project and the next funding, whatever… and I ended up there and luckily had a scientist nearby who could explain nanoscience…’ Keeping pace with the openness of the processes of valorisation means that, on top of the minor portion of time spent making art (which Warming estimated constituted as little as 10% of her time), a good deal of time is spent educating herself in new fields of research, marketing her art, and, not least, the ‘really hard and really tight’ labour of generating connections.

Like many precarious immaterial labourers, Warming needs to be constantly at the ready to be taken up by the cycle of production as opportunities arise. This engages her in an ongoing labour of opportunistic connection, self-invention, and curation. As Lazzarato (1996: 136) suggests, ‘(b)ehind the label of the independent "self-employed" worker, what we actually find is an intellectual proletarian’… for whom ‘it becomes increasingly difficult to distinguish leisure time from work time’; ‘in a sense,’ suggests Lazzarato (1996: 137), ‘life becomes inseparable from work.’ Lazzarato (1996: 136) writes:

The cycle of production comes into operation only when it is required by the capitalist; once the job has been done, the cycle dissolves back into the networks and flows that make possible the reproduction and enrichment of its productive capacities. Precariousness, hyperexploitation, mobility, and hierarchy are the most obvious characteristics of metropolitan immaterial labor.

As sociologists of recent decades have argued, such precariousness is no longer merely a feature of ‘lower-paid and lower-skilled workers’, but also ‘well-paid and high-status workers’ (Gill and Pratt 2008). As Threadgold (2018: 159) notes, ‘casualisation, upward-credentialising and education inflation in the youth labour market has led precarity to be experienced even by those in the well-educated middle classes.’

Yet, while there has been significant sociological interest in what the precarious labourer *lacks* – employment, income or job security, social opportunities, control over the circumstances of their lives and so on (Standing 2011; Castel 2003;Ross 2009; Vosko 2010), less has been written about the way in which precarity functions as its own ‘machine of subjectivation’ (Lazzarato 2006). To focus solely on the deprivations suffered by labourers is to risk overlooking the genuinely productive dimension of contemporary capitalism, and the ways in which its production of economic value and of subjectivity coincide, in an era in which subjectivity is the key product of the cycle of immaterial production.

As a self-employed worker, Warming assumes certain responsibilities and risks in exchange for the freedom of self-management. As an artist driven to forge interdisciplinary connections, Warming has the freedom to pursue those connections that will be the most fruitful for her practice. Yet, the collaborations she generates are only indirectly value-productive for her, just as they are indirectly value-productive for the artists and scientists with whom she collaborates. Among the costs involved in creating opportunities are the time invested in generating networks, understanding scientific knowledge, learning to use new software, not to mention engaging in artistic practice. But the return for one’s investment of labour time is indirect and socially distributed. Immaterial labour produces forms of subjectivity in which the lines between being valuable and being expendable are often blurred.

Again, the point is not to emphasise what the precarious labourer lacks, so much as to indicate the modes of subjectivation produced when subjectivity and economy, life and labour become inseparable in these ways. In the case of the precarious worker, what we are dealing with, according to Lazzarato (1996: 135), is ‘a pure virtuality, a capacity that is as yet undetermined.’ The precarious worker needs to be ‘at the ready’ for the moment when their efforts and skills are sufficiently valuable to be taken up within the cycle of production. Yet, it is not a question of merely waiting until one’s given qualities are valuable, but of partaking in an opportunistic process of producing oneself – individually and collaboratively – as valuable. Precarity stems in part from the fact that there is no single set of qualities that must be individually or collectively acquired, since the processes of valorisation are fluid and variable. For a self-employed artist such as Warming, then, subjectivity functions as a kind of node of opportunistic and plastic potentiality within the equally opportunistic flows of capitalist production.

**Conclusion**

There is no doubt that ‘creativity is astir’ across the globe, with the logic of the ‘total creative imperative’ becoming increasingly dominant as a route to innovation and, equally importantly, as an economic value in its own right (Raunig et al 2011: 1). Within this context of a generalised demand for creativity, I have argued that emerging forms of ArtScience practice offer a useful site in which to examine the process by which sociality, especially in its collaborative and communicative dimensions, becomes value productive. Artistic practice at the interface with scientific practice is especially interesting because the need to operate across disciplinary bounds renders visible the collaborative and communicative labour that are so crucial to this stage of capitalism.

Following Lazzarato, I have suggested that the challenge for post-Fordist capitalism is to produce the social relation as a capital relation; thus, the production of subjectivity is at the heart of the productive capacity of immaterial labour. In the context of ArtScience, we could think of the individual subjectivation of the artist as ‘artist’, the collective subjectivation of the ArtScience team, but also the production of the consumer as an active consumer, along with the environment in which these modes of subjectivation live and reproduce. What is important is that ‘the process of social communication (and its principal content, the production of subjectivity) becomes here directly productive because in a certain way it “produces” production’ (Lazzarato 1996: 142).

The tone throughout Lazzarato’s work is polemical. He is emphatic about the imperative character of immaterial labour’s injunction to communicate: ‘we have here a discourse that is authoritarian: one *has to* express oneself, one *has to* speak, communicate, cooperate, and so forth’ (Lazzarato 1996: 134). Empirical analyses of contemporary cultural practice give a more nuanced sense of the specificities of concrete contexts, and the margins of freedom within them. In the first case study explored, ArtScience practice is, to some extent at least, able to draw a readymade communicational model from the institution of the university and adapt it to a more contemporary form of institution; namely, the ‘node.’ Here the practice of ArtScience involves the generation and communication of productive synergies. What is essential to the viability of such endeavours is not merely the creation of value, but continual innovation in the forms of communication themselves; in this, the production of subjectivity with a ‘natural’ enthusiasm for ArtScience is a plus. For the self-employed artist, in contrast, the pursuit of interdisciplinary collaborations is necessarily opportunistic. Without the foundation of an institution or innovation node, the self-employed artist may attain a degree of freedom by being as self-directed as possible. Yet, in exchange for the more prescriptive modes of subjectivation, the precarious self-employed artist is produced as a ‘a kind of pure virtuality’ subject to the whims of economic valorisation (Lazzarato 2011).

The theoretical contributions of Lazzarato and other radical Italian theorists in recent decades have painted a convincing picture of a social and cultural terrain that differs significantly from the Fordist paradigm. As artistic practice becomes more interdisciplinary in orientation, it inevitably assumes new roles within the broad terrain of cultural production. The inventiveness with which artists situate themselves and intervene in this rapidly changing context provides crucial insight into the ways that the generalised creative imperative is lived.

**Notes**

 There are various ways that interdisciplinary practices at the nexus of art and science are designated. For the purposes of this paper, I have chosen to use the term ArtScience to designate an emerging field of practice that is qualitatively distinct from art and science as individual disciplines. In the discussion of the case studies, I have used the term that is most accurate to that context.

2 All quotations for the case studies, unless indicated otherwise, are from personal communication with the artists.

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