The Role of Creativity in Expertise and Skilled Action

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Abstract

Perhaps a part of what makes expertise so inspiring to the curious researcher is the possibility of appropriating the structural components of skilled action to draw a roadmap towards their achievement that anyone might be able to follow. Accordingly, the purpose of this essay is to shed light upon the role that creativity plays in the production and environment of skilled action to that foregoing end. In doing so, I suggest that the lessons to be learned from recent empirical research on creativity has much to offer to the cognitive science of skill and expertise. Experts are able to bring their intelligence to bear in controlling fast and seemingly automatic actions by utilizing a form of control often called 'intelligent automaticity.' In this spirit, I argue that the environment of intelligently automatic action control curates a similarly ideal environment for the processes of creativity. Moreover, insofar as creativity is ideally operative within the environment of expert action control, I argue further that creativity functions as one representative form of 'intelligence' embedded within otherwise fluid, and automatic expert actions. Creativity is able to do so even without conscious representation through the powers of incubated cognition.

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When expert actions are also creative, they stand out. Much of what we find so inspirational and powerful in action performed at the very limits of skill are those performances that also transcend boundaries, lead the future forward, and are, in a word, saturated with creativity. As it often happens with creative breakthroughs, an expert's creativity has a downstream effect of influencing all future performances within that expert's domain. Magnus Carlsen's wing-pawn attacks have changed chess tactics in the last decade just as Dick Fosbury's innovative 'flop' technique in the high jump reinvented the entire sport more than half a century ago. Whether it be in competitive environments or private ones, the power of creativity as expressed through innovative and original acts is an indelible tool that both fascinates and inspires. Accordingly, the purpose of this essay is to investigate the role of creativity in expertise and to likewise shed light on its cognitive operations in the construction, control, and performance of skilled actions.

New work in the philosophy and cognitive science of skilled action has trended towards a model of skill (which I call the '*sophisticated hybrid model*') suggesting that skilled performances are those in which automatic and intelligent action controls are able to work together in an expert's successful performance (*e.g.*, Fridland, 2015; Christensen et al., 2016; Shepherd, 2017; Toner and Moran, 2021; Mylopoulos and Pacherie, 2021). The upshot of such a model is that automatic action controls can count as *intelligent* as long as they are appropriately sensitive to higher order intentions and executive commands. Likewise, intelligent controls can operate *automatically* as long as they are sufficiently flexible within the shifting sea of complex affordances that make up an expert's domain of performance. The product of this model is an interpretation which makes skillful actions out to be *intelligently automatic* actions that are often fluid and fast, though never fully without the executive influence of their expert-agent.

In contrast, beginning as early as Plato's *Ion* (534a-e), creativity has enjoyed a storied history of research largely consisting in the idea that executive control is anathema to the creative process. After all, how could Homer have spoken so eloquently about the machinations and characters of bronze age warfare having lived so many centuries after the fact… if not for the divine inspiration of his Muse? How could Michelangelo have crafted his David, so perfect and so complete, without the touch of some otherworldly and external force of genius – or Socrates, bumbling orator that he was, the masterful display of eloquence in *Apologia* without the shouldered influence of his virtuous daemon? Toy examples aside, early academic and folk psychological conceptions of creativity champion models in which creative acts are generated 'from without' (e.g., a muse) rather than 'from within' (e.g., agent-intelligence). However, recent strides in interpretation have made conceptual space for the possible influence and participation of agency in creative acts. Similar to automaticity in skill, these interpretations of creativity would have it that intelligent controls can and do affect creative processes such that the intentional and cognitive underpinnings of that creative process may be made consistent with a more 'naturalistic' (non-spooky, or divinely inspired) worldview.

The overlap in models of skilled action and creativity is clear. Common intuitions have guided both literatures along analogous interpretive strategies. Moreover, where creativity and skill overlap, there is a shared theme of interpretation in the embeddedness of intelligence covertly affecting automatic or otherwise pre-conscious processes. But the waters are muddy. We may wish to say that there *is* intelligence 'under the covers' of creative and automatic actions, but isolating that covert intelligence from its overt expression in action presents a genuine puzzle. How should we model and measure the influence of intelligence in the control of actions if some intelligent controls never reach the level of explicit phenomenological representation? The purpose of this

essay is to show that our best models of creativity and expertise each respectively go a long way towards answering this question, and that each may learn from the other in coming to better navigate their way through the puzzle of unconscious (though intelligent) 'cognition-under-the-covers.' To this end, this essay makes three contributions:

First, I argue that in states of optimal performance, experts are able to subtend their executive, intelligent control below the surface of consciousness – performing instead with the form of control called 'intelligent automaticity.' There are many ways to understand the intentional structure of intelligently automatic action control. Some would have it that intelligent control remains dominant amidst automaticity (Christensen et al.,2016; Pavese, 2019), others remain neutral with respect to the executive quality of intelligence in skilled automaticity (Toner and Moran, 2021), and there are others who even liberally suggest that what *appear* to be wholly routinized and mechanistic automatic performances may still bear the requisite mark of intelligence (Fridland, 2017; Carruthers, 2011). For the purposes of my argument, I shall take on a fairly liberal model of intelligence as operative within intelligently automatic performance. Direct executive control over actions or creative processes would certainly make an action intelligent, but where direct executive control is functionally missing, I shall show that there is still good reason to think that automatic, skilled actions may count as both creative and intelligent.

Second, I argue that a type of creative cognition called 'incubation' involves important features of person-level intelligence even though it remains free from strictly executive and conscious control. As with the nature of intelligent control in skilled action, there are many models of creative cognition of which 'incubation' is only one variety. Creativity is, after all, an incredibly complex phenomenon with its own exigent cognitive and embodied architecture to make sense of within the environment of action generally, let alone within that of expert action. Creativity is

sometimes described as a resultant feature of executive functioning (Gazzaniga et al., 2014), elsewhere as an a-representational symptom of enactive/embodied processes (Carruthers, 2011; Rucinska and Aggerholm, 2019), and classically, as intimated above, the product of constrained stochasticity, musing divinities, and mystery. The account that I give of creativity is a pluralistic one ultimately aimed at neutrality with respect to the potential incongruences between these models. There are all sorts of fascinating ways that creativity and skilled action control interrelate. Nevertheless, in choosing incubation as the target of the present essay, I intend to show that even where conscious executive cognition fades into shadow, there is still a place for intelligence at the intersection of creativity and skill. Even the most spontaneous (seeming) forms of creativity have a role to play in the most automatic (seeming) environments of skilled action, thereby rendering those actions justifiably and empirically 'intelligent.'

Accordingly, following these foregoing suggestions, I conclude that experts are not only able to perform better when they do so with intelligent automaticity, but they also produce in themselves a wonderfully fruitful environment for creative productivity via the nonconscious incubation of their intelligent resources. The deeper experts may fall into absorbed states of automaticity, the greater the effect that incubated creativity stands to have upon their performances and, correspondingly, to render those deeply automatic performances intelligent, divergent, and groundbreaking as is due the expert operating at their very best.

I. Sophisticated Hybrid Models of Skill

Within the philosophy of expertise, there are three historically championed models of skilled action. One, the 'Anti-intellectualist' model, says that skill is a matter of automating action and that the more automatically and mindlessly one performs, the better off they will be (Dreyfus, 2013; Bergamin, 2016; Di Nucci, 2013). The second camp of 'Intellectualists' argue to the contrary

– the skilled action of experts is saturated with intelligent control and mindfulness; in fact, mindless automaticity is suggested to be an impediment and 'false ceiling' to the development of true expertise (Yarrow, 2009; Montero, 2016; Pavese, 2019). A third model attempts to resolve the tensions between the two foregoing camps by offering a 'Hybrid' account in which both automatic and intelligent controls each have a distinct role in the production of skilled actions (Evans and Stanovich, 2013; Furley et al., 2015).

Although each of the three models represent skill uniquely, they each share in common a problematic intuition that, when confronted, calls for a new development in how expertise and skill ought to be understood. Specifically, the intuition is that action control is either fast and automatic *or* intelligent and slow, and whichever model of expertise you ascribe to will make out one (or the interchange) of these forms of control to be the exemplar of skill. Consequently, each of the foregoing models agrees that automaticity and intelligent control are mutually exclusive with one another. When an action is automatic, it is mechanistic, reactive, and mindless (Shiffrin and Schneider, 1977; Fitts and Posner, 1967). Likewise, when an action is under intelligent control, it is deliberate, considered, and mindful (Kahneman, 2011; Evans and Stanovich, 2013). These properties *do* seem to be at odds with one another, at least conceptually. After all, how could an action be both mindless and deliberate; both reactive and considered? At face value, the question is quite troubling, especially in light of empirical evidence strongly indicating that, in practice, skilled action is often *both* automatic *and* intelligent (Pinder et al., 2011; Muller and Abernethy, 2012; Loffing and Hagemann, 2014; Murphy et al., 2016; Runswick et al., 2018). New *sophisticated hybrid* models of skill relieve this tension by doing away with the assumption that intelligence and automaticity are mutually exclusive with one another in the control of skilled action, instead positing that skillful action is *intelligently automatic* action.

Whereas the three historically championed models of skill took action to be *either* intelligently controlled *or* automatic, these new sophisticated views see intelligence and automaticity as inextricably linked in skilled action. For those views that admit of an *intelligent automaticity*, an expert's mastery of either automatic or intelligent action control is less the measure of skill than is the expert's strategic ability to flex between these controls in order to overcome afforded challenges (Shepherd, 2017; Christensen et al., 2016; Fridland, 2017; Pacherie and Mylopoulos, 2021; Toner and Moran, 2021). If actions are sufficiently flexible within the variable conditions of a performance, and those actions display a sensitivity of automaticity to intelligence (and vice versa) – then those actions count as skilled and their performer an expert. The significant qualifier for skill consequently becomes concerned with *how* an action holistically fits into the process of a skillful performance rather than *what* the properties of any particular action within that performance are.

The foregoing point is highlighted by Toner and Moran's (2021) model of skill, following Bebko et al. (2005). They argue that processes related to automaticity and those related to intelligent control tend to develop orthogonally and semi-independently of one another. According to this model, it is when the two orthogonally developed processes work together in tandem that experts are able to act skillfully in what they call 'clutch states' – a state characterized by intense focus, fluidity, and sensitivity to environmental complexity. Hence, "clutch states will only arise if the movement system possesses the flexibility to tailor parametric control to the fine-grained structure of a situation. Skilled agents are capable of this because they possess movement repertoires that are inherently variable, allowing [successful outcomes] to be achieved in different ways by dynamic systems of movement" (Toner and Moran, 2021, p. 10). Clutch states are fast and uninhibited by slow thinking, but nevertheless remain sensitive to higher order executive

commands to edit and shift performance. What matters for skillful action in 'clutch' and analogous modes of intelligently automatic control is how dynamic an expert is able to remain in increasingly challenging circumstances. Experts must often act quickly, but speed ought not to come at the cost of inflexibility to environmental variability that may only be overcome by the appropriate executive shifting of one's tactics.

For Toner and Moran's model as well as for its analog sophisticated hybrid counterparts, task control is understood to be *dynamic*. Skillfulness is a property that arises from the relation of automatic and intelligent controls within a series of actions. Although a single action may be successful, for it to count as skillful on these models it should also fit into a series of actions that, altogether, reflect dynamic flexibility to the expert's environment. So, a successful outcome isn't all that matters for skill, but also *how* that success was produced. After all, a model that might, by mistake, call an isolated instance of beginner's luck skillful merely because it was serendipitously successful would be incomplete. Though successful, beginner's luck is just that – lucky. It is not intelligently controlled nor would it be reliably reproduceable as an analogously successful outcome would be when performed by an expert. Insofar as skillfulness is modeled after a dynamic *process*, beginners luck remains what it is: a lucky outlier.[1] As a result, the sophisticated hybrid model makes out the dynamism at the heart of skill to be a kind of process having to do with the overlapping relationship of intelligent and automatic action controls flexibly operating in response to complex environmental solicitation.

[1] It's worth noting here that experts can be lucky in their own right just as well as beginners. The case of beginners' luck is proffered to be more illustrative of a mistake in modelling expertise than the alternative case in which an expert gets lucky. However, a model of expertise should be able to reliably distinguish between any kind of chance and true skillful action. The upshot here is that this distinction is made by focusing on how a series of actions fit together rather than an analysis of any single action in particular. Skill is found in flexibility and accordingly, flexibility is found in a relation of actions together rather than in isolation from one another.

As the sophisticated hybrid story goes, for experts the relation of intelligence with automaticity in skilled action is more than a mere shifting from the one to the other, but moreover a true *meshing* (Christensen et al., 2016) or *embeddedness* (Mylopoulos, 2020). Automatic and intelligent controls in skilled action are not only dynamic in that they can give way to one another as solicited by the task at hand, but they are also un-isolable from one another. A skilled automatic action carries with it a history of training and intelligence to perform *just so* under the conditions in which it was afforded (Fridland, 2015). Likewise, even when they are not phenomenologically represented, intelligent controls have been seen to edit how automatic actions are performed by pre-conscious anticipation-states (Murphy et al., 2016). What is automatic is embedded with intelligence, and intelligence can operate in conditions of automaticity. When skillfully integrated, these forms of action control are neither in conflict with one another, nor are they mutually exclusive.

Accordingly, we can draw two general conclusions from the foregoing discussion of sophisticated hybrid models of skilled action. First, skilled action is *intelligently automatic*; it is integrally related to the performing expert's executive, intelligent control. Experts know how and when to act automatically. Moreover, even in states of dominantly automatic action, experts' actions are still intelligent to the extent that what experts do is guided by how they wish to perform. And second, skill is a process. Clutch and the like do not occur in isolation of a whole performance, but rather exist in the flexible, dynamic procession of actions colored by automaticity under the influence of intelligent control. Thus, intelligently automatic actions are able to remain dynamic and flexible but also fast and reactive within the complex rush of affordances experts must respond to in order that they may be successful.

Flexibility and dynamism are, however, only a point of evidence for the embeddedness of intelligent controls in skilled, automatic actions. When automatically skilled actions are flexible, we have good reason to believe that they are also intelligently controlled. Nevertheless, what an expert's internal cognitive architecture consists of within such states of performance remains a mystery to unravel. In other words, the flexible performance of skilled and automatic actions is a matter of motor behavior that we can see and measure, but what are the internal mechanisms of cognition and mind which make this flexibility possible? Answers to this question are divided. Some researchers suggest that action controls for skilled automaticities will require executively represented intentions. Pavese (2020) and Christensen (2016), for instance, argue that whatever form of expert cognition enables flexibly automatic motor behavior ought always to be co-extensive with some form of executively represented control. According to the foregoing models, although skilled actions are flexibly automatic, their flexibility is best explained by a form of explicit executive control which is equally cognitively flexible.

Alternative views of intelligent automaticity are more liberal with respect to the explicit representation of executive controls in skilled, automatic action. Fridland (2015, p. 4359) seems to indicate as much in concluding that for intelligently automatic actions at the limit of automaticity, "it isn't at all obvious that such processes are best construed as "intelligent" either. That is, it is questionable whether such processes ought to be characterized as propositional, conceptual, truth preserving states." To my mind, Fridland is right – there is a substantive difference in kind between perfectly mechanical automaticities like breathing or digestion, perfectly intentional actions that accord with the classic accounts of intention[2], and that third class

[2] i.e., Davidsonian belief desire pairs, Anscombean why question/answers, and all of the derivative accounts which surround them in the supporting literature on intention.

of actions which are the target of our current discussion: the intelligently automatic. In that middle space between the executively controlled and mechanically automatic, expert actions are both *fast* and *sensitive* to highly articulate, domain-specific knowledge, even to the limits of spontaneity and automaticity. Where there is no clear representation of executive control, yet expert action remains dynamically flexible, we are left with an empirical puzzle: automatic actions appear to be intelligent, but how so?

One increasingly popular answer to this question is to say that the intelligence is not executive in the mind, but rather becomes executive through the body (Noë, 2004; Rucinska and Aggerholm, 2019). I am sympathetic to enactive accounts of mind and perception, though I do not think they tell the whole story of control in expertise. There are interesting features of cognition (represented or unconscious) operative throughout the control of skilled action, even when it is at its most automatic. Thus, although there may be (and very likely is) a role for the body to explain intelligence and, by extension creativity, this essay finds its target in a different field: in that of cognition and mind amidst automaticity and creativity.

In the introduction to this essay, I briefly discussed the importance of creativity for skilled action. Creativity in skilled performance has the power to impact and effect change in the way that actions are performed within a domain. Moreover, the blend of creativity with skill is often a wellspring of inspiration and awe. We are drawn to the elegant and powerful ways that experts and exemplars push forward the boundaries of what can be done. From a folk-psychological perspective, creativity and skill go hand in hand. Yet, as we lifted back the folk-psychological veil over skilled action, our conception of it became far more *sophisticated*. The same shall be true of creativity. Nevertheless, in sophistication there is complication, and how we ought to make sense of creativity's role in the complex, *intelligently automatic* production of skillful action is not

immediately clear. In the following section of this essay, I shall argue that creativity does play such a role and that a better understanding of creativity likewise affords a better understanding of the role that intelligence plays in expert automaticity.

II. Finding a Place for Creativity in Skill

Creativity in its simplest and least controversial (though somewhat uninformative) formulation is "originality that works" (*see* Gaut and Livingston, 2003 *for a review*). The products of creativity should not only be *new*[3], but also *intelligible* within the paradigm of the domain for which those products were invented. As Kant rightly points out in his Third Critique, originality is not sufficient for creative genius (5:307-308). After all, any number of monkeys (or, as it may happen, a philosopher in a coffee shop) chaotically tapping away on a keyboard may be sufficiently original. Yet, for all the 'originality' inscribed on the page, it would be amazing to find anything other than complete gibberish. Hence, according to Kant, what enables originality to transcend to the creative work of genius is that it is also *exemplary*; it is an *intelligible* development that broadens the scope of the domain within which the creative act fits. Recall the example given at the outset of this essay: Dick Fosbury's 'flop' technique in the high jump was an unthinkably original innovation that reinvented the sport. Yet, not only was the technique Fosbury's own original creation, but it has also remained an intelligible and universally recommended development upon the old way of jumping. Thus, it was an act of creative genius because it was both originally new and collectively intelligible as formative for the sport.

[3] There is some discussion of what sort of 'newness' creativity requires. Boden (1990), for example, distinguishes between *historical* and *psychological* novelty in creative acts. Though it could be possible for someone to discover the Pythagorean theorem without ever having been taught it, this discovery would only be new to its discoverer, as the rest of the world has been up to date on triangles since Ancient Greece. If novelty is a condition for creativity, we can still call the individual discovery of the Pythagorean theorem *psychologically* creative, though with a limited *historical* scope (*See* Stokes 2007 *for further discussion on this point*). The target of the present discussion is creativity in general, so either form of novelty will suffice.

The simple definition, 'originality that works,' satisfies our common-sense idea of creativity. Creative processes and products should be novel, and they should also be distinctively intelligible. Picasso's novel representation of motion in cubistic two-dimensional space *works* – it represents forms as it means to, and it does so in a way that had not been done before. Below the surface of common sense, however, there is a clash in understanding creativity as simultaneously original and intelligible. When creatively original acts are also spontaneous – as in moments of insight, realization, or when we find ourselves automatically interacting with the world *just so* in order to succeed – it may seem as if those acts have occurred without our direct participation (and perhaps even *because* we did not participate in them).[4] Or, more poetically put, "Expression begins where thought ends," as Albert Camus tells us in *The Myth of Sisyphus*. Though his purpose in saying so is slightly different than the present one, the insight is nevertheless perspicacious. The idea is that the traditional notion of 'creative originality' is anathema to anticipation, control of, or (strictly speaking) any propositional *intention* to produce the original moment spontaneously derived, *ex nihhilo,* at the other end of a creative act. Thus, if intelligibility implies an intelligence in design, but spontaneous originality correspondingly entails an incapacity for anticipation, planning, or executive control, then it is unclear how deliberate, intentional thought may be capable of doing anything creative at all.

Similar to the anti-intellectualist conception of expertise in which skilled action is equated with mindless automaticity, we might give the same name to the foregoing conception of creativity. For the anti-intellectualist about creativity, spontaneously original moments are neither preconceived, nor deliberated upon. Rather, they are something more akin to divine inspiration, a

[4] It has even been argued that spontaneity is a necessary condition of creative originality insofar as *all* novel acts are likewise spontaneous ones (Kronfeldner, 2009; 2018). For the purposes of this argument, I remain neutral with respect to whether creative originality necessarily entails spontaneity, and limit the focus of my analysis to those original acts that are spontaneous or otherwise automatic – whether it be all of them or just some.

reliably fortuitous accident, or mindlessly natural virtuosity. Further still, the fact of an anti-intellectualist conception of creative originality is fortified by the often-described phenomenology of creativity. Sometimes called 'flash phenomenology' (Norlyk, 2011; Stokes, 2011), the experience in which creative moments come to us are said to be like bolts of lightning – to be elicited out of the blue in a single stroke. All of a sudden, an 'Aha!' strikes us, and in a moment, the creative act is set underway. The creative inspiration itself is experienced as a spontaneous, unintelligible happening; as the muses speak through their poet, creativity is (metaphorically) akin to an outside channeling as opposed to an endogenously controlled, intelligent intending.

There are problems for thinking of creativity in this anti-intellectualist way, however. First and foremost – to the heart of this essay – if all skilled actions are necessarily *intelligent* even when automatic, then creativity would be incongruous with expertise. Consider the following argument: (1) If an action is skillful according to the *sophisticated hybrid model*, then even when it's performed automatically, it bears the mark and inscription of an agent's intelligence (enabling it to remain flexible and dynamic within the expert's complex environment of solicitation and affordance). (2) The 'originality' condition of creativity is anathema to intelligent control insofar as the products of creativity are both novel to and unanticipated by the creative person. (C) Therefore, the incongruity of intelligent control with originality disallows creative acts from counting as skillful.

We could accept this conclusion, though it is a rather large bullet to bite. Kant postulates along similar lines in declaring that acts of creative genius are not the products of an artist's intentional deciding how to create, but rather are "inborn predispositions of the mind through which *nature* gives the rule to art" (5:307). For Kant, the principle of creativity is one inscribed in the mind of the genius by nature rather than by the intentions and mental constructs of the genius

themselves. Similarly, Plato's *Ion* draws a clear boundary between skillfulness (mastery) and creative artistry. "You see, it's not mastery that enables [rhapsodes] to speak those verses, but a divine power, since if they know how to speak beautifully on one type of poetry by mastering the subject, they could do so for all the others also" (*Ion,* 534c5-7). Like with Kant, Socrates' proclamation reveals a commitment to an anti-intellectualist view of creative inspiration as exogenous to its performing artist. What makes the rhapsode (or creative person in general) capable of doing as they do is not some intention or cognitive power of their own, but is rather an external power influencing and enabling their creative productions.

With due respect to Plato and Kant and all those who follow in their respective historical traditions, the conclusion of the foregoing argument is likely not one we wish to be committed to today. For one, the anti-intellectualist conception of creativity lends itself to a *spooky* (non-natural) worldview. Divine inspiration and teleological forces inspiring artistic creations in unfalsifiable and immeasurable ways loom like shadows in the anti-intellectualist's periphery. Creativity on this view is an unnatural gift rather than a cognitive tool to be honed and developed. And more to the point, the conclusion commits us to a view in which creativity and skill are irreconcilable. To the contrary, not only is there robust research showing the possibility and efficacy of training creativity for improving skill (Karpova et al., 2011; Ritter and Mostert, 2017; Vally et al., 2019; Ritter et al., 2020 – *just to name a few*), but recent empirical work has gone a long way in showing that there are measurable neurocognitive and attention-oriented components of creative thinking (Furley et al., 2015; Murphy et al., 2016; Roca et al., 2018).

For instance, Roca et al. (2021) demonstrated that creative soccer players fixated more often and for less duration on informative locations in the field of play than less creative counterparts. Thus, creative players tended to "use a broader breadth of attention by taking in a

large range of key task-relevant information," and this not only improved their performance, but it also enhanced how the more creative players reported on why they acted as they did. Clearly then, creative decision making consists in more than an unexplainable inspiration by *spooky objects from the ether*. The cognitive and attentional correlates of creative decision making are empirically measurable and significant strategic components of skillful actions.

Further still, based on empirical evidence like the foregoing, there are accounts of creativity which would have it that "cognitive control processes… give us cognitive flexibility, letting us think and act in novel and creative ways" (Gazzaniga et al., 2014). Creativity, that is, may be explained as a feature of executive controls operating in a corresponding manner. Certainly, there are ways of inducing creative outputs and actions executively – just as a chess player might find a sequence by running through a deliberate series of options, or a logician by applying different rules of translation to axioms finding what novel combinations might result. Given these considerations, we may simply want to say that the anti-intellectualist about creativity is old fashioned, off-base, or just out of touch with our newly empirical understanding of creativity in association with executive control. The anti-intellectualist commitments to spontaneity and originality, that is, are not worth our commitment given what we know about cognition involved in the creative processes.

We should be wary, however, of writing off the anti-intellectualist too quickly. Just because some forms of creative output are associated with conscious executive controls does not mean that all of them must be. As with intelligent control for skill, there are likely many varieties of creativity that abide different degrees of automaticity and spontaneity. Carruthers (2011), for instance, suggests a 'constrained stochasticity' model of creativity which has it that in cases like improvisation (Berliner, 1994; Owens, 1995; Sudnow and Dreyfus, 2001; Baird, 2012) and spontaneous reaction (Runswick et al. 2018; Ivy et al., 2021), creative events are "action-first," or

represented in action prior to being representationally encoded by conscious thought. The action-first model has it that experts direct their course of action with a degree of stochasticity constrained by some rule or principle which serves to limit the stochastic nexus of possible actions to probably successful ones. After an act becomes successful in spontaneous production, it is encoded into memory and serves to improve the principle upon which creative stochasticity is constrained.

Carruthers' model does not explain all instances of creative generation, but is certainly fruitful for giving sense to creativity in its more spontaneous, automatic modes. Creative events can happen fast, and they can happen without our being consciously aware of their generation in action or thought. When creativity operates automatically, at speed, or spontaneously, as we've seen for 'intelligently automatic action controls,' its underlying structure is left in a middle space between full executive control and mere random happening. It does not appear as if such events could abide a fully intentional cognitive presentation, nor does it seem as if such events should be written off as accident. Carruthers' action-first model of creativity would have it that creative events *are* accidental, though reasonable insofar as their random generation was under the guidance of a constraining heuristic. But is this enough for 'intelligent control?'

Even with such heuristics, we might find the stochastic account of creativity too cognitively sparse to rise to the level of intelligence in control. There is a form of intelligence in the stochastic-constraining principle, but it is more indirect and holistic than executive and targeted.[5] This is a far cry from robust executive control, and to satisfy the condition that all skilled action ought to remain intelligent, Carruthers' model may just fall too short.[6] To allow creative *accident* to rise to

[5] And it is for this reason that Carruthers argues that the true intelligence from such acts occurs after their ad hoc generation in the action-first schema: action first, cognition second.

[6] I do not mean to say that Carruthers is misguided in his stochastic, action-first model of creativity; just that such an account will be incomplete if it does not also include intelligence-fixing cognitions that are also (unconsciously) operative through automatic and creative performances. This is what I introduce in §III and §IV below.

the level of creative *action*, we should see something of agency, control, and executive power within it – even where those actions are automatic or spontaneous. Hence, whether teleological (Kant), divine (Plato), or even stochastic (Carruthers), as intimated above, exporting the exigent intelligence of creative acts beyond the mind of the performing agent renders those actions' intelligibility mysterious – and in this mystery, likewise problematic for sophisticated hybrid models of skill.

Accordingly, if we want to be able to count creative acts as skillful ones, accepting the anti-intellectualist conclusion of the foregoing argument will do us few favors. Yet, we are not without options for reconciliation. We could maintain anti-intellectualist commitments by denying (1) that, 'according to the *sophisticated hybrid model* skilled actions always carry with them a sensitivity to the intelligent control of their performing agent, even when automatic.' Creativity and skill could then be consistent insofar as each would be left inexplicably automatic or exogenously controlled. However, such a move would also be in conflict with much of what was discussed in §I, lauding the virtues of sophisticated hybrid models over their counterparts. Anti-intellectualist intuitions that come off too strongly lead to dead ends in empirical modeling and explaining instances of skilled actions that are both automatic and flexible within the expert's shifting and complex environment. This will not do; if the problem is not to be found in the first premise, we should look to the second: 'the 'originality' condition of creativity is anathema to intelligent control.'

As with the foregoing strategy, it would be similarly problematic to give up the originality condition of creativity outright. Originality is creativity's distinguishing factor and, in part, what

makes it so valuable. Creative acts and products do not inspire the world and move their respective domains forward by being entirely derivative reproductions of what's come before. We deprecate plagiarism rightly. Nevertheless, one cannot will to make or do what has not been previously made or done without a simultaneously original inspiration – as of some novel recombination of conceptual space, or by forging out into a new, shadowy territory of possibility. Before Mendeleev was spontaneously struck with his creative insight to organize the natural elements into a periodic table, their relative combination together was a problem. It was not immediately obvious how the elements should be held together, even for the many brilliant minds of the day who were wholly up to date with all of the physical chemistry. The missing piece of the puzzle, the movement from problem to solution, required a creative act. It required an *original* and previously unseen insight to represent the elements in a way that they had not been represented before.

Consequently, if we are to forge a place in the sophisticated hybrid model of skilled action for the role of creativity, the way forward is not to do away with originality. Rather, the way forward will be to renegotiate our understanding of originality so that it can maintain its novelty while at the same time be made consistent with the notion of endogenous, agent-centered intelligent control and influence. In other words, the way forward will be to draw a parallel between automaticity and originality with respect to their shared sensitivity to intelligence and flexible control. I take on this issue in the following sections of the essay by ultimately arguing that creativity is a form of unconscious cognition that flourishes in the intelligently automatic environment of expert performance.

III. The Unconscious Incubation of Creativity

The problem we ran into in the previous section of the paper was that, at a closer look, the co-necessity of originality *and* intelligibility for creative acts makes them incongruous with

sophisticated hybrid models of skilled action. According to the model, skilled actions should always be intelligently controlled, even when automatic; and when actions are 'creatively original' (on an anti-intellectualist conception of the term), the sophisticated hybrid sort of intelligent control cannot inhere in them. The goal, then, for rectifying this incongruity and making sense of creativity as a component of skill will require giving up the anti-intellectualist conception of creative originality. In its place, we will need to construct a notion of originality that satisfies three conditions. It should (1) preserve novelty, (2) be respectful of creativity's 'flash phenomenology' in spontaneity, and likewise (3) maintain the notion of intelligibility for creative acts. Consequently, the question to be answered is: how can we make sense of creative acts as *original* and also sensitive to (or perhaps even sourced in) *intelligent control*? The answer, in a word, is incubation.

The concept of incubation as part of the cognitive problem-solving process is not a necessarily new one. Incubation plays an essential role in Wallas' (1926) proposed four-step model of creative generativity spanning from Preparation to Incubation and eventual Illumination and Verification. Wallas' inspiration for this model comes from an often-cited anecdote given by famous mathematician, Poincaré:

> "I left Caen, where I was living, to go on a geologic excursion under the auspices of the School of Mines. The incidents of the travel made me forget my mathematical work. Having reached Coutances, we entered an omnibus to go some place or other. At the moment when I put my foot on the step, the idea came to me, without anything in my former thoughts seeming to have paved the way for it, that the transformations I had used to define the Fuchsian functions were identical with those of non-Euclidian geometry. I did not verify the idea; I should not have had the time, as upon taking my seat in the omnibus, I went on with a conversation already commenced, but I felt a perfect certainty. On my return to Caen, for conscience' sake, I verified the result at my leisure." (Poincaré qtd. in Hadamard, 1945).

The idea is that problems do not always require the forces of executive *conscious* attention to be resolved. We don't always have to 'try' to solve a problem in order to come to its answer.

Sometimes problems resolve themselves by incubating below the surface of our conscious experience. After some amount of time, these incubated ideas boil over into conscious experience by affording a spontaneous 'illumination' that is then verified as an intelligible, original, and positive step forward in the creative person's problem-solving procedure.

Likewise, with respect to creative cognition specifically, Stokes (2007, 2011) distinguishes between 'incubated cognitive processing and 'incubation effects.' The former of these is the unconscious process wherein problems are not given direct conscious attention and 'the problems are solved for us.' "It is a period where conscious attention is removed from some stimulus, but unconscious cognitive processing continues with regard to that stimulus" (p. 15). The latter 'incubation effect' is the illuminative insight that is produced – in a flash – on the other end of unconscious creative incubation. Importantly, Stokes' incubated model of creative cognitive processing explains the 'flash-phenomenological' quality of insights and illuminations without giving over to unnatural or otherwise spooky forces of creative power. Incubated creative cognitions need not be explained by reference to a divine muse, or a supernatural teleological force. They are rather understood as the products of our own unconscious cognitive processing. The benefit of understanding creative problem solving as a form of Incubated cognition is that it allows us to do away with the problematic consequences of the alternative anti-intellectual model. When the products of creativity are given a causal history in human cognition, they are able to be empirically measured and modelled. Moreover, the tension between intelligibility and originality in creativity can be swept away with a little conceptual analysis.

Creative insights and spontaneous 'Aha' moments, as exemplified by Poincaré's above, strike us as if they came from nowhere. If the incubation model of creative cognition is correct, this experience is unsurprising. Insofar as the problem-solving process didn't involve our

executive, conscious attention, we should likewise be unaware of the fact that any problem solving was going on at all. Accordingly, when one is struck with a creative insight, they are surprised – the insight *feels* as if it's as new to its progenitor as it might be to anyone. Because they didn't take conscious part in the creative act's generation, it feels as if the creative act could not have come from them, and the act's intelligibility becomes an unexplainable mystery. Consequently, the anti-intellectualist takes this phenomenological experience as a metaphysical criterion of creativity, concluding that the feeling of originality is sufficient for an agent's non-participation. However, this move mistakes the *feeling* of originality for *actual* originality – and what matters for creativity is the latter sort: whether or not one feels that something is novel doesn't actually make it so (Boden, 1990). For instance, in a moment of creative illumination we may have forgotten that we already came up with the insight, or alternatively someone else may have developed the very same idea already. In either case, we may *feel* that our idea is original, but it is not. What matters for creativity is not that the insight or act *feels* novel, but rather that it *is* novel with respect to the domain within which it fits. Our phenomenological experience has no causal bearing on the objective fact of a creative insight's novelty.[7]

What the incubation model of creative cognition teaches us is that insights that feel new to us still have a source in our unconscious cognitive processing, and thus are *intelligibly* produced. Insights don't feel novel because they were generated by some exogenous power, but rather because we did not *consciously* participate in their creation. We may thus distinguish between *phenomenological originality* (P-originality) and *actual originality* (A-originality). An insight is P-original when we experience its generation as non-causally connected to our conscious

[7] That said, the feeling of having an original insight is likely strongly correlated with the insight's being actually novel – whether psychologically or historically (to use Boden's terms).

experience. Alternatively, an insight is A-original when it is a novel development for the domain within which it applies. Whether or not we feel that an idea or act is P-original will have no causal bearing on its A-originality (though it may be strongly correlated). This latter sort is measured by factors external to us: was the idea *actually* new to us or new to the world? If so, then it is A-original.[8]

Furthermore, with respect to intelligibility, the content of P-originality is misleading. Even if a creative insight affords P-originality, it may still remain *intelligible* precisely because it was (unconsciously) incubated and developed by cognitive processes associated with one's intelligence. Therefore, with the help of incubated cognition, we can leave the problematic qualities of the anti-intellectualist intuitions about creativity in the rearview mirror. Creativity as "originality that works" may be reinterpreted as 'A-originality that remains intelligible because it is sourced in non-conscious cognitive processes directly related to the creative person's *incubated* intelligence.' Nevertheless, this definition should remain amenable to anti-intellectualists about creativity insofar as it salvages the spontaneity of creativity, appropriating it to a naturalizable, empirically measurable formulation consistent with the requirement of intelligence from sophisticated hybrid models of skilled action control. If in our most creative moments there is a divine muse who speaks through us, she communicates in the language of human cognition.

IV. The Role of Incubated Creativity in Intelligently Automatic Action Control

Recall the second premise of the anti-intellectualist argument regarding sophisticated hybrid accounts of skill and the role of creativity given in §II. In the argument, it was supposed

[8] With Boden's distinction in mind, it is important to avoid equivocation between A-originality of the psychological and the historical varieties. An insight's being A-original is neutral with respect to its psychological or historical context, although the context will limit the scope of the insight's originality. For example, an insight may remain A-original psychologically, yet be only P-original historically. In contrast, historical A-originality should always also be psychologically A-original as well (at least with respect to its original generation).

that creativity was anathema to intelligent control due to its P-originality. However, with a new understanding of creative (A-)originality now in hand, we can see the mistake. When creative insights are developed under the surface of conscious experience via incubation, their illumination affords P-originality, but are really products of intelligent processes (Dijskterhuis and Strick, 2016; Marien et al., 2012; Bargh, 2011). After all, it isn't just any joe-shmo who one day wakes up from a fevered sleep with the indelible insight that benzene's molecular structure forms a ring. It takes an expert. Kékule's incensed ouroboros-dream certainly 'illuminated' his creative breakthrough, but its unconscious development was only possible because he was a master chemist. What occurs below the surface of conscious experience in unconscious incubation takes what the expert knows, operates on it, and produces creative insight. Consequently, there is a remarkable similarity between incubated creative cognition and intelligent automaticity. For either, under the surface of conscious experience, intelligent controls remain operative in influencing actions and insights. What remains to be shown is the empirical evidence of these unconscious operations, and likewise to understand how they give rise to creativity and diversity through action and thought.

With respect to skill, the empirical markers for intelligent controls that are operative in otherwise automatic actions are 'flexes,' shifts, and edits to fast behaviors reflective of a sensitivity to one's changing environment. As was shown in the Runswick et al. (2018) study, expert cricket batsmen were able to edit their swings and reduce error with all but 80ms of information occluded from view. This is only a measure of intelligent automaticity in empirical isolation, however – a proof of concept. In actual expert performance, intelligent controls fluidly shift from active conscious representation to a more subtle influencing of automatic action as solicited by the task at hand. Experts don't always need to (nor should they) consciously represent intelligent instructions for action in order to be successful. Rather, what the expert achieves through training

is the ability to shift their conscious direction of action into more automatic, less conscious (though intelligent, nonetheless) modes of control when called for – e.g., in 'clutch' and 'flow' states (Csikszentmihalyi and Nakamura 2010). The capacity for this form of action-control-shift is a strategy for success allowing experts to react quickly or to perform many actions in fast succession, but it also has a further benefit insofar as *the reduction of conscious control enables an incubation of creative solutions to active challenges*.

There is a large body of research showing that incubated cognition enhances creativity and increases general success in performing problem solving tasks (*see* Ritter, 2014; Gilhooly, 2016 *for helpful reviews*). One of the most influential of these studies is a meta-analysis performed by Sio and Ormerod (2009) who reviewed 117 studies on the positive effects of incubation for divergent problem solving. The majority of the analyzed studies measured incubation effects by inviting participants to solve a complex problem – often an open-ended visual search or language-based task. Problem solving would then be interrupted for a period of time by introducing distractions or alternative cognitive load bearing tasks like arithmetical problems to allow unconscious processing to actively incubate the original task.

According to this model, studies on incubation effects typically run in a variable three-stage paradigm. Participants are first given a 'preparation period' in which they are asked to solve a problem, most commonly a *remote association task* (RAT; Mednick, 1962; Marko et al., 2019) whereby participants are given three stimulus words and asked to find a fourth word that associates with them (e.g. *home, sea, bed :: sick*). Variations on this task sometimes include more open-ended tasks (which will be discussed further below) to allow for broader spectra of creative diversity in solutions (e.g., "name things you can do with a brick," "invent new pasta names ending with the letter 'i.'") After their preparation period, an incubation period begins by interrupting

participants with a novel task attention-demanding task, often arithmetic problems or "n-back" tests (Jonides et al., 1997) that demand one's full concentration. The length of these distractor tasks ranged from between 3-5 minutes (Hasford, 2014) to 15-20 minutes (Smith and Blankenship 1989) and even in some cases to months at a time (Ritter et al., 2020).[9] Finally, the post-incubation period begins when participants are asked to return to the original problem set and offer their newly incubated solutions.

Sio and Omerod report that across the 177 selected studies, longer periods of incubation between distraction and the original task led to more significant effects[10]. They also found that incubation attenuated by lower cognitive load led to the strongest effects. "When solving a creative problem, individuals benefit from performing a wide search of their knowledge to identify as many relevant connections as possible with the presented stimuli. Each time individuals reapproach the problem, they improve their performance by extending the search to previously unexplored areas of their knowledge network. Incubation appears to facilitate the widening of search of a knowledge network in this fashion" (*ibid*). And here we can see the intelligent effects of incubation on creative problem solving. Even when subjects' attention is diverted elsewhere during incubation periods, their minds still operated on the original problem underneath conscious awareness, recombining elements into new possibilities (Seifert et al., 1995), breaking through recalcitrant memories with selective forgetting (Smith and Blankenship, 1991), and by eliciting new knowledge through the

[9] The length of the incubation period sometimes shows greater success in problem solving, though does not always (Sio and Omerod 2009; Djiksterhuis and Strick 2016). It is supposed that manipulating the length of incubation to correlate success with unconscious cognitive processing is a matter of task/problem-type. Whether this is true, or to what extent it is true is an avenue for future research, however.

[10] Studies with longer incubation periods (>15 minutes of distraction) may provide enough time, as in the case of Ritter's (2020) longitudinal study, for conscious thinking to do some problem solving on its own. However, where incubation periods remain within the limit of one's attention span (3-20 minutes), the distraction tasks are sufficient for ensuring that conscious problem solving does not occur on an original problem set. To avoid controversy, I rely on these latter studies rather than the longitudinal ones to draw conclusions about the effects of incubation on creativity.

more parallel thought networks available to unconscious cognition (Bowers et al., 1990; Smith, 1995; Dijksterhuis, 2009). Moreover, in one the most famous of the foregoing studies on incubation effects, Dijksterhuis and Meurs (D&M) (2006) found that across three unique experiments, incubation effects directly correlated to creativity in problem-solving performance by promoting greater divergence in thinking.

In the first of D&M's experiments, participants were asked to generate novel names for types of pasta and presented with five examples, each of which ended in the letter 'i.' It was supposed that more divergent answers to the question would render pasta names which did not end in the letter 'i' whereas more convergent answers would end with 'i.' Participants were then randomly divided into three conditions: the first of which would have them begin answering right away (immediate), the second condition would have the participants wait three minutes without distraction to think about their answers (conscious thinking), and a third condition in which participants were distracted with an attention-demanding hand-eye coordination task (unconscious thinking) before answering. D&M correctly hypothesized that participants assigned to the unconscious thinking condition would respond to the 'pasta' question with significantly greater divergence than those in the conscious and immediate conditions, showing the positive effect of incubation on novelty in thinking.

D&M's second experiment shifted the paradigm of manipulation from divergence in problem solving to conscious accessibility by measuring the relevance of answers to a new question. In this experiment participants were asked to generate Dutch place names beginning with the letter A (Amsterdam and Arnemuiden were given as examples). The population of a place (city or village or otherwise) was assigned to the relative accessibility of an answer, meaning villages with smaller populations would be less accessible in long term memory than large cities.

Again, D&M correctly hypothesized that the participants who were given a period of unconscious incubation would provide significantly less accessible answers than their immediate and conscious thinking counterparts. This again showed the positive effect of incubation not only for novelty in thinking, but also on a form of parallel thinking for which less likely candidate answers become ecologically viable.

Finally, in the third of D&M's experiments, participants were asked to name things they can do with a brick. And in the same conditions as the foregoing two experiments, D&M found that it was the unconscious thinking group who gave the most significantly creative answers. Independent judges found that the conscious and immediate thinking group gave less creative and more conservative answers to the same question.

D&M sum up their research with the following three insights: "Conscious thought led to more items in line with a cue, whereas unconscious thought led to more items diverging from this cue. Conscious thought led to more accessible items, whereas unconscious thought led to more inaccessible items. Finally, unconscious thought led to more creative and unusual items than conscious thought. In all experiments, unconscious thinkers also differed significantly from participants who were not given time to think at all" (*ibid,* p. 143-144). Accordingly, incubation improves performance and generates more divergent and creative solutions through intelligent, unconscious processing. And this is not to say that conscious processing is bad for problem solving, rather that it is simply less creative. Conscious thinking yields convergent, accessible, and straightforward answers, and sometimes this might be of the most benefit. Nevertheless, where there is room for divergence and the parallel processing of less accessible portions of knowledge, incubation effects will yield more creative solutions when given the chance.

There is also good neurological evidence to support the foregoing conclusion that diminished cognitive control facilitates creativity. Kenett et al. (2021) report that targeted stimulation of the brain to either inhibit or excite the left prefrontal cortex reliably induced semantic divergence or convergence of answers to questions similar to a RAT test. The researchers used two forms of electrical stimulation on two sets of participants. The first set of participants underwent cathodal stimulation which reduced activity in the left prefrontal cortex, thus diminishing executive cognitive activity during RAT questioning. Participants in this first condition gave answers that were significantly novel and semantically diverse compared to participants in a control group. The opposite effect was found in participants of the second condition who were cathodally stimulated, thereby increasing cognitive activity in the left prefrontal cortex during questioning (*see also*Miller 2000; Chi and Snyder, 2011; Weinberger, Green, and Chrysikou, 2017; Chrysikou 2019). This finding is further neurological evidence that the reduction of cognitive load and executive function is correlated with creative problem solving.

In summation, not all forms of incubated cognition are creative, nor are all actions within a skilled performance managed by intelligently automatic controls. However, where and when these functions overlap, we shall find expertise in its finest form. What the empirical evidence shows is that experts are able to reduce conscious cognitive load by acting with a greater degree of automaticity influenced by non-consciously represented intelligent controls. Furthermore, when the conscious cognitive load is reduced and one's intelligent problem solving is likewise shifted into unconscious incubation, the solutions produced at the other end of this process are more creative and better adapted to their problem set. This is a boon for the expert – especially in a competitive environment – to whom creative solutions for challenging problems are an essential component of success. Thus, the expert's capacity to successfully perform intelligently automatic

action is a window through which creative cognition may incubate novel and fruitful solutions to the complex challenges they are faced with. And with this insight, we have forged a place in the *sophisticated hybrid* model of skilled action for creativity at the limits of automaticity. In such cases, creativity is able to operate as a form of incubated cognition that thrives in the intelligently automatic environment of skilled action performed by experts.

V. Concluding Remarks

To conclude, I will sum up what has so far been argued, make certain important hedges on what my argument is licensed to prove, and look forward to the future of research that may be done in the spirit of creative incubation within an environment of intelligently automatic action.

To the first of these points, I began by presenting an argument favoring the newest sophisticated hybrid models of skilled action. These models are superior to their anti-intellectual, intellectual, and pure hybrid counterparts insofar as they do not take automatic and intelligent action controls to be mutually exclusive with one another. There is good reason to think that even when actions are dominantly automatic, intelligent controls still influence how an expert both acts and reacts within their environment. Although this sophisticated hybrid view of skill manages to make sense of the empirical data on expert action control, it leaves the commonsense (anti-intellectual) view of creativity twisting in the wind. This is because in order to make sense of creativity as both intelligible and spontaneously original, it is important to divorce the phenomenology of an insight's novelty from the actuality of its novelty. Whereas the phenomenological experience of an insight's novelty may preclude the idea that its creator took direct part in its production, this is not true of the insight's actual novelty. The actuality of an insight's novelty is consistent with its being sensitive to a process of cognitively intelligible production when it is unconsciously incubated. Further, incubated cognition has been shown to

improve problem solving and produce more divergent, creative solutions to problems. Consequently, as experts shift the intelligent control of their actions into a more unconscious and *intelligently automatic* form of control, they induce in themselves an ideal environment for unconscious creative incubation and all of the fruitful products that should follow from it.

With respect to the scope of my argument, there are limits to its range of commitment for creativity and skilled action. First and foremost – as with most human factors in cognitive phenomena, creativity is complex; at least as complex as expertise. There may well be many forms of creative cognition, of which incubation is only one sort. I have argued that the incubated sort of creativity has a role to play in intelligently automatic expertise, but alternative forms of creativity remain undiscussed. There is more to be said for straightforwardly executive creative thinking, as well as creativity in its embodied modes of representation. Further still, at the risk of alienating my strongly naturalist colleagues, I personally remain agnostic to anti-intellectualist explanations of creativity as a possible force of *ex nihilo* generativity. I am not convinced that it profits philosophical debate to be dogmatic in one way or the other. Perhaps there are muses and spooky exogenous teleological forces, although I certainly wouldn't hold out hope if I were unfortunate enough to depend upon their existence. That said, I at least recognize the great mystery of creative production at all. Too far down the rabbit hole of 'where does anything come from?', there is only darkness. The best we can do is to use our best tools to measure and make sense of the evidence available to us – and that is the natural world of mind, cognition, and body. To this end, the purpose of this essay was to wash away some potential dogmatism with respect to creativity and show that, at least for the unconsciously incubated sort, there is a role (and a very important one at that) to be played by creative problem solving in the intelligently automatic environment of expertise.

As a final word, I believe that the role that incubated creativity plays in expertise as outlined through this essay goes some way towards better understanding what is meant by 'intelligent automaticity' at all. The subtending of intelligent action control below the surface of conscious experience admits of an empirical challenge. Isolating the intelligent from the automatic in an empirical design made to control for intelligently automatic actions is not a simple task (perhaps impossible) – especially when the subject-participants stand to be wholly unreliable narrators. The best evidence we could retrieve from experts' first personal reports on incubated creative generativity is, at best, something of a 'sideways on' perspective of what happens under the surface of their conscious experience. However, by introducing incubated cognition into the environment of intelligently automatic control, researchers of skill and expertise may find an important cognitive texture upon which future study can take grip. The unconscious incubation of cognition is a well-studied paradigm with well measured cognitive and attentional correlates. If even in the worst case, there were never any incontrovertible indication of unconscious executive action control, then at least a confluence of indirectly related cognitive markers (like incubated creativity) could tell a strongly correlative story about intelligently automatic action. And while we collectively hope for better than this worst case, there remains plenty of fruitful work to be done in mapping out that correlative network of cognition in automatic and unconscious forms of expert action. After all, acquiring a more complete understanding of expertise may just require a little bit of creativity.

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