Divine Inhibition:

Thinking about God Makes Believers Less Creative

Across time and culture and in fields as disparate as Science and the Arts, there has been a persistent belief that creativity is divinely inspired. Nonetheless, existing research has not considered the psychological impact that believers' thinking about God might have on creative problem solving. While some scientists, such as Nobel Prize winning physicist Charles Townes, have been vocal in their belief that God was directly related to their ground-breaking discoveries (Townes, 2005), they seem to represent a minority view. Indeed, 93% of the members of the National Academy of Sciences, an organization composed of the most outstanding scientific discoverers in the US, reject God (Larson & Witham, 1998). This begs the question of whether looking to God for creative inspiration is actually effective. This question is especially important given that, in stark contrast to the members of the National Academy of Sciences, a majority of people across the globe claim to believe in God. Indeed, in every decade since 1944 – when Gallup first started collecting information on religious beliefs – at least 91% of Americans surveyed claimed to believe in God, and as such, are more likely to think of God than would nonbelievers (Newport, 2011). Thus, belief in God remains central to the lives of millions even as the demand for creativity and innovation continues to increase.

The ubiquity and importance of religion in the lives of so many has led to a vibrant stream of research exploring the psychological consequences of religiosity (for a review see: Emmons & Paloutzian, 2003) and of thinking about God (for a review see: Shariff et al., 2015). Drawing predictions from this growing stream of research, coupled with evidence from the leadership literature (e.g., Shamir, 2007), we argue that believers may employ a passive follower mindset when thinking about God, which in turn, may have negative consequences for creativity. Specifically, we focus on Abrahamic religions in which God is

viewed as omnipotent, omnipresent, and omniscient (Laurin, Kay, & Fitzsimons, 2012). For believers in these religions, God serves as the ultimate leader, able to provide optimal responses to three of the most fundamental human needs of order, security, and meaning (Popper, 2015; Shamir, 2004). In response, we predict that believers will employ a passive followership mindset, willingly submitting to God's direction and guidance, offering their devotion and faith in return (Kelley, 1992; Bjugstad, Thach, Thompson, & Morris, 2006). In turn, this stance, although advantageous in many regards, will extinguish the independent and non-conforming mindset that is necessary for creative ingenuity (De Dreu & West, 2001; Nemeth, 1986; Nemeth & Staw, 1989; Nemeth, Personnaz, Personnaz, & Goncalo, 2004).

In five studies, we systematically explore this prediction for the first time. In two correlational studies, we found preliminary evidence that belief in God is negatively associated with two different indicators of creative ingenuity: creative personality (Study 1a) and patent output per state (Study 1b). In three experimental studies, we provide converging evidence that among believers, thinking about God led to reduced performance on a remote association task (Study 2 and Study 4) and on a structured imagination task (Study 3), relative to a control condition. In the final study, we tested the full moderated mediation model and found passive followership to be the key driver of reduced creativity among believers thinking about God (Study 4). These results held both in the lab and in the real world, across different measures of creativity, different manipulations of thinking about God, and across different countries (U.S. and Israel), demonstrating the robustness of this effect.

Our findings move organizational research forward in two critical ways. First, by exploring how thinking about God may impact believers' creativity, we are able to expand on existing organizational research which, with few exceptions, has tended to avoid exploring religiosity in the workplace, despite its central importance to both individual and organizational functioning (Chan-Serafin, Brief & George, 2013; Tracey, 2012). Given that

believers do not leave God outside of the organizational walls, understanding how people's faith may interact with task performance is paramount. Second, by specifying and measuring a passive follower mindset as the underlying mechanism, we make a novel connection between the religiosity research and the nascent research on followership (Van Vugt, Hogan & Kaiser, 2008). Although followership is an integral part of the leadership phenomenon, it has received very little theoretical and empirical attention (Junker & van Dick, 2014). Our results emphasize the potential fruitfulness of research which takes into account the expected mindset induced by different types of leaders and testing their impact on performance.

References

Bjugstad, K., Thach, E. C., Thompson, K. J., & Morris, A. (2006). A fresh look at followership: A model for matching followership and leadership styles. *Journal of Behavioral and Applied Management*, *7*(3), 304.

Chan-Serafin, S., Brief, A. P., & George, J. M. (2013). Perspective—How does religion matter and why? Religion and the organizational sciences. *Organization Science*, *24*(5), 1585-1600.

De Dreu, C. K., & West, M. A. (2001). Minority dissent and team innovation: the importance of participation in decision making. *Journal of applied Psychology*, *86*(6), 1191.

Emmons, R. A., & Paloutzian, R. F. (2003). The psychology of religion. *Annual review of psychology*, *54*(1), 377-402.

Junker, N. M., & van Dick, R. (2014). Implicit theories in organizational settings: A systematic review and research agenda of implicit leadership and followership theories. *The Leadership Quarterly*, *25*(6), 1154-1173.

Kelley, R. E. (1992). *The power of followership: How to create leaders people want to follow, and followers who lead themselves*. Broadway Business.

Larson, E. J. & Witham, L. (1998). Leading scientists still reject God, *Nature*, *394*, 313.

Laurin, K., Kay, A. C., & Fitzsimons, G. M. (2012). Divergent effects of activating thoughts of God on self-regulation. *Journal of personality and social psychology*, *102*, 4-21.

Nemeth, C. J. (1986). Differential contributions of majority and minority influence. *Psychological review*, *93*(1), 23.

Nemeth, C. J., Personnaz, B., Personnaz, M., & Goncalo, J. A. (2004). The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology*, *34*(4), 365-374.

Nemeth, C. J., & Staw, B. M. (1989). The tradeoffs of social control and innovation in groups and organizations. *Advances in experimental social psychology*, *22*, 175-210.

Newport, F (2011). More Than 9 in 10 Americans Continue to Believe in God. Gallup. Retrieved from http://www.gallup.com/poll/147887/americans-continue-believe-god.aspx

Popper, M. (2015). Followership, deity and leadership. *Journal for the Theory of Social Behaviour*, *46*(2), 211-228.

Shamir, B. (2004). Motivation of followers. *Encyclopaedia of leadership*, 500-504.

Shamir, B. (2007). From passive recipients to active co-producers: Followers' roles in the leadership process. *Follower-centered perspectives on leadership: A tribute to the memory of James R. Meindl*, 9-39.

Shariff, A. F., Willard, A. K., Andersen, T., & Norenzayan, A. (2015). Religious priming a meta-analysis with a focus on prosociality. *Personality and Social Psychology Review*, 1-22.

Townes, C. (2005, June 17). Retrieved from http://www.berkeley.edu/news/media/releases/2005/06/17_townes.shtml

Tracey, P. (2012). Religion and organization: A critical review of current trends and future directions. *The Academy of Management Annals*, *6*(1), 87-134.

Van Vugt, M., Hogan, R., & Kaiser, R. B. (2008). Leadership, followership, and evolution: some lessons from the past. *American Psychologist*, *63*(3), 182-196.

Unconscious inspiration: Frequent interruptions can spark creativity

Can we be creative when we are constantly being interrupted? Accumulated research suggests that the answer to this question is "no". Studies seem to be asserting that frequent interruptions can impede our problem-solving ability (Speier, Valacich, & Vessey, 1999) and cause strain, which restricts creative thinking (Van Dyne, Jehn, & Cummings, 2002). Nevertheless, technological and social developments require us to be creative while being frequently interrupted (Morgan, Patrick, Waldron, King, & Patrick, 2009).

Frequent interruptions hinder performance because they force one to shift attention from the task at hand and thus interfere with the maintenance of relevant information in working memory (Altman, Trafton, & Hambick, 2014). Disrupting working memory is problematic for analytical and procedural tasks, in which one needs to follow a specific sequence of steps and reach a single solution. (e.g., Botvinick & Bylsma, 2005; Speier et al., 1999). Whether interruption impedes performance in other tasks, and specifically in creative tasks, which require flexibility and the generation of multiple different solutions to a problem, remains unanswered. While the research has identified numerous negative consequences of interruptions, we believe that interruptions may not all be adverse and ask: Can frequent interruptions contribute to creativity?

Research suggests that taking a break from a task enables incubation, which increases creativity (Wallas, 1926). A break from a task (whether intentional or not) allows a fresh perspective (Sio & Ormerod, 2009), and a broader and more flexible search in memory (Baird, Smallwood, Mrazek, Kam, Franklin, & Schooler, 2012). Yet, typical incubation studies have examined the effect of a single interruption rather than frequent interruptions during a task.

We suggest that frequent interruptions can help overcome mental fixedness, and allow people to restructure the problem elements and reveal novel solutions (Sio & Ormerod, 2009). We tested this hypothesis in two studies. In study 1, 61 engineering students completed an idea generation task, during which they were either interrupted once, multiple times or not at all. Participants in both single and frequent interruption conditions generated more ideas, $F_{(2,58)} = 5.27$, $p = 0.008$, and their ideas were more original, $F_{(2,58)} = 4.78$; $p = 0.012$, $\eta^2 = 0.15$, compared to participants who worked continuously with no interruption.

The goal of the second study was twofold: to replicate the effect of frequent interruptions on creativity with a different creativity task, including the idea selection and elaboration stages in addition to idea generation; and to examine potential mechanisms that can explain this effect.

Research suggests three different explanations for the effect of interruptions on creativity. The passive approach asserts that an interruption enhances creativity by "derailing the train of thought". When shifting attention away from the creativity task, one forgets the previous thread of thought and then approaches the problem from a different perspective (Smith & Blankenship, 1991). Another explanation attributes the enhancing effect of interruptions to mind wandering - a mode of unguided and associative thinking (Baird, Smallwood, Mrazek, Kam, Franklin, & Schooler, 2012). The third mechanism is unconscious thought, often defined as "deliberation without attention" (Dijksterhuis & Meurs, 2006). When individuals switch from the primary task to work on an interrupting task, they may keep searching for the primary task's solution unconsciously. Unconscious thought has unlimited capacity and enables access to unusual associations, which are blocked by more dominant and usual associations when one thinks consciously. In study 2, we examined these explanations by including two additional frequent interruption conditions in addition the one included in Study 1. In addition to creativity, we measured memory performance and felt exhaustion.

250 participants were randomly assigned to one of five interruption conditions. Like in Study 1, we included a control condition with no interruption, a single interruption condition and a frequent interruption condition. We also included two new frequent interruptions conditions. In one condition the interrupting task was much easier than in the other interruption conditions, to allow for mind wandering during its solution. In the other condition, participants could see the ideas they generated prior to the interruption and thus did not suffer from memory loss. All participants completed one creativity task with three stages: 1) generation of ideas for new mobile applications, 2) selection of the most creative idea and 3) elaboration of this idea.

Similar to Study 1 findings, results indicated that interruptions of any kind increased the number of generated ideas relative to no interruption, $F(4,228) = 4.42$, $p < 0.05$, $\eta^2 = 0.16$. Interruptions also increased elaboration, measured as the number of words describing their new application, $F(4,228) = 3.18$, $p < 0.05$.

To test whether there is a boost in the number of generated ideas after each interruption and to better understand the underlying mechanism, we examined the process of idea generation over time. Repeated measure analysis revealed a decrease in the number of ideas generated over time, $F(8,220) = 24.62$, $p < 0.001$. However, there was an interaction between time and interruption conditions, $F(16,212) = 83.98$, $p < 0.001$. Both in the single and frequent interruption conditions, there was a significant increase in the number of generated ideas following each interruption. Interestingly, the same analysis with subjective sense of exhaustion over time revealed that participants in the frequent interruption conditions felt significantly more exhausted as time passed $F(3,136) = 9.84$, $p < 0.001$, suggesting that interruptions elicit unconscious processes that enhance creativity. There were no differences in creativity between the three conditions of frequent interruptions, suggesting that their effect cannot be attributed to memory loss and to mind wandering. Together our findings provide initial evidence that frequent interruptions can spark creativity in idea generation tasks.

References

Altmann, E. M., Trafton, J. G., & Hambrick, D. Z. (2014). Momentary interruptions can derail the train of thought. *Journal of Experimental Psychology: General, 143*(1), 215-226.

Baird, B., Smallwood, J., Mrazek, M. D., Kam, J., Franklin, M. S., & Schooler, J. W. (2012). Inspired by distraction: Mind-wandering facilitates creative incubation. *Psychological Science*, *23*, 1117-1122.

Botvinick, M. M., & Bylsma, L. M. (2005). Distraction and action slips in an everyday task: Evidence for a dynamic representation of task context. *Psychonomic Bulletin & Review*, *12*(6), 1011-1017.

Dijksterhuis, A., & Meurs, T. (2006). Where creativity resides: The generative power of unconscious thought. *Consciousness and Cognition*, *15*(1), 135-146.

Morgan, P. L., Patrick, J., Waldron, S. M., King, S. L., & Patrick, T. (2009). Improving memory after interruption: Exploiting soft constraints and manipulating information access cost. *Journal of Experimental Psychology: Applied*, *15*(4), 291-306.

Sio, U. N., & Ormerod, T. (2009). Does incubation enhance problem solving? A meta-analytic review. *Psychological Bulletin*, *135*(1), 94-120.

Smith, S. M., & Blankenship, S. E. (1991). Incubation and the persistence of fixation in problem solving. *American Journal of Psychology*, 61-87.

Speier, C., Valacich, J. S., & Vessey, I. (1999). The influence of task interruption on individual decision making: An information overload perspective. *Decision Sciences*, *30*(2), 337-360.

Van Dyne, L., Jehn, K. A., & Cummings, A. (2002). Differential effects of strain on two forms of work performance: Individual employee sales and creativity. *Journal of Organizational Behavior, 23*(1), 57-74.

Wallas, G. (1926). *The art of thought*. New York: Harcourt Brace.

Modes of secrecy influencing creativity in innovation processes. Examples from the Danish Pharma Industry

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The present paper explores the relevance of secretive behaviour on idea generation and creativity in science-based innovation processes. We are particularly interested in the different modalities of formal and informal secrecy and thediscretionary spaces it creates. How are those manoeuvred and managed to induce creativity, and what are their unintended effects that may produce negative results for creativity and innovation? Our insights are drawn from a qualitative study among Danish pharmaceutical companies, which is part of a larger research project.

Organizational secrecy – "the ongoing formal and informal social processes of intentional concealment of information from actors by actors in organizations" (Costas and Grey 2014: 1423) – has emerged as a central organizing mechanism for creative processes in a diverse set of industries. Companies regarded as epitomes of creativity, such as Google, tend to organize the work on their most creative and uncertain projects in top-secret labs resembling the well-known phenomenon of "skunk works" (Rich and Janos 1994). At Google X, for instance, the company's "intensely private innovation lab" (Gertner 2014), top engineers and scientists work on "moonshots" such as self-driving cars, delivery drones, or electronic contact lenses, organizationally and spatially cut-off from the main Google campus, and usually kept in absolute secrecy until the general public is considered ready for "contact" with the radical innovations. Similar patterns can be observed in the biotech and pharmaceutical industries. Companies protect "discovery research activities […] by a system of locked laboratories" (Liebeskind 1997: 651), and research cooperation is heavily regulated with confidentiality agreements. In this sense, secrecy is employed as a way of dealing with the uncertainties inherent throughout creative processes: from working on highly uncertain creative projects, through preventing competitors from acquiring knowledge about pharmaceutical novelties, to orchestrating marketing campaigns for markets characterized by highly uncertain demand. In all instances, secrecy seems to operate primarily through *temporality* or, to be more precise, the timing of *when* and to whom information is revealed/concealed that is employed in order to organize creative processes. Thus, the well-timed intentional concealment (and revelation) of information appears to be the key for organizing highly uncertain creative processes. At the same time, secretive behaviour creates *spatial* (it often works through the creation of secret spaces as in the "skunk works" phenomenon) and *symbolic* (i.e. status and identity implications for those involved and/or excluded by processes of secrecy) arenas that induce or impede creative processes.

Whereas such anecdotal evidence suggests that secrecy seems to be of immense practical importance for individual and collective actors in science-based industries, extant research has not explicitly engaged in investigating processes of organizational secrecy in the context of creativity and innovation.In fact, the literature even produces some confusion, as different streams of research emphasize contradictory effects of secrecy on creative processes.

For instance, much of the extant literature on creativity in a variety of fields tends to frame secrecy as a problem for creativity. Researchers have traditionally assumed that free knowledge-sharing, rather than secrecy, is associated with increased levels of creativity (e.g. Amabile 1996; Perry-Smith 2006; Perry-Smith and Shalley 2003; Wang and Noe 2010). This assumption is implicit in legal discussions of the function of patents as an incentive to the dissemination of knowledge (e.g. Maurer and Zugelder 2000). It is also central to the growing body of literature on "open innovation" (Chesbrough 2003; Dahlander and Gann 2010; Laursen and Salter 2014) that, in spite of its emphasis on only

selectively revealing valuable knowledge (Henkel 2006; Henkel et al. 2014), generally celebrates open knowledge-sharing for facilitating collaborative inter-organizational relations and shaping the competitive environment (Alexy et al. 2013). Similarly, in economic geography the main emphasis has been on fostering connections among organizations co-located in clusters in order to stimulate knowledge-sharing, and thus, creativity (Bathelt et al. 2004; Martin and Moodysson 2013; Maskell 2001; Storper and Venables 2004). In organization theory, a recent surge of interest in *knowledge-hiding* also suggests that cultures of secrecy can have detrimental effects on creativity, entrapping organizational members in spirals of silence (Cerne et al. 2014; Perlow and Repenning 2009; see also Liebeskind and Oliver 1998; Connelly et al. 2012). In sum, this dominant perspective suggests that *ideally* organizational secrecy should be kept at a minimum in order to avoid its traps and let creativity flourish. But why then are organizations and individuals *actively* engaging in processes of intentional and well-timed concealment of information in order to organize creative work?

Although this question has not been addressed explicitly so far, some clues can be found scattered around different bodies of literature. One tentative answer is provided by research in law and economics (e.g. Anton and Yao 2004; Cheung 1982; Epstein 2004; Scheppele 1988; Stead and Cross 2009; Swedberg 2003) that portrays trade secrets, such as the secret Coca-Cola recipe, and intellectual property laws as a key mechanism for protecting inventions and, thus, as a way to manage the economic uncertainty inherent in creative processes (see also Delerue and Lejeune 2011; Dougherty 2001; Hannah 2005, 2007; Katila et al. 2008; Knott and Posen 2009; Teece 1986). By protecting pieces of secret knowledge from open sharing and/or rendering them as economic property (Cheung 1982), so the argument goes, a 'regime of appropriability' (Teece 1986) is created that enables economic actors to secure potentially uncertain future profits. Thus, secrecy emerges as a key source, yet also difficult to manage, of competitive advantage, especially in the context of creative and knowledge-based industries (for a recent review, see Bos et al. 2015). However, secrecy seems to matter not only as a market strategy for protecting innovations, but also as an *organizational* phenomenon, in particular in the early phases of creative processes. At such stages, novel ideas are still fragile and need to be protected from criticism until they are "ripe" enough for legitimation (e.g. Kupferberg 2006). Given the inherently contested and politicized nature of organizational creativity (Drazin et al. 1999), groups engaged in such processes might prefer to informally keep novelties secret until they are ready for official dissemination, as creative processes might end up generating outputs so radically novel that they would challenge existing organizational power and authority relations. In sum, this research suggests that, rather than being only a barrier to creativity, secrecy might have a number of advantageous effects on creative processes.

As secrecy turns out to be such a key dimension of organizational life, the question of how, when and with what consequences secrecy can be employed to organize creative processes is of central importance for organizations. Against this background our project strives to extend practical and theoretical knowledge on the role of secrecy for managing creative processes.

The proposed paper presents the results of our explorative, qualitative study consisting of 40 interviews with scientists and managers working in R&D of Danish pharmaceutical companies. The interviews have shown that rather than being considered negatively, secretive behaviour in the pharma industry is taken for granted and the need for secrecy is associated with the status and worth of an idea. Based on these interviews, we have assessed and organised the various modes of secrecy that play a role throughout the different stages of the innovation processes in the pharmaceutical sector (i.e. idea generation, idea implementation, trials and regulation). It shows that beyond the well-organised *formal* modes of secrecy (e.g. trade secrets, confidentiality agreements), *informal* modes of secrecy based on trust, loyalty and exploitation of grey zones seem to play a key role in innovation processes and become a modality of organising in their own right. Following the presentation of different forms of secrecy throughout the innovation process, the paper then presents three in-depth accounts of secrecy

instances that display present the complex intentions and unintended effects of such behaviour on creativity. Based on these observations we have become particularly interested in how the discretionary spaces created through secretive behaviour and their intended and unintended effects are manoeuvred and managed. Our aim is to explore those aspects of secrecy that have not been illuminated by functionalist and informational approaches to secrecy, thus unfolding the complexity and ambivalence of secrecy in innovation.

Bibliography

Alexy, O., George, G. and Salter, A.J. 2013. Cui bono? The selective revealing of knowledge and its implications for innovative activity. *Academy of Management Review* 38(2): 270-291.

Amabile, T.M. 1996. *Creativity in Context*. Boulder, CO.: Westview Press.

Anton, J. and Yao, D. 2004. Little patents and big secrets: Managing intellectual property. RAND *Journal of Economics* 35(1): 1-22.

Bathelt, H., Malmberg, A. and Maskell, P. 2004. Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography* 28(1): 31-56.

Bos, B., Broekhuizen, T.L.J. and de Faria, P. 2015. A dynamic view on secrecy management. Forthcoming in *Journal of Business Research*. Available online before print under: doi:10.1016/j.jbusres.2015.04.009.

Cerne, M., Nerstad, C., Dysvik, A. and Skerlavaj, M. 2014. What goes around comes around: Knowledge hiding, perceived motivational climate, and creativity. Academy *of Management Journal* 57(1): 172-192.

Chesbrough, H. 2003. *Open Innovation*. Cambridge, MA: Harvard University Press.

Cheung, S.N.S. 1982. Property rights in trade secrets. *Economic Inquiry* 20(1): 40-53.

Connelly, C.E., Zweig, D., Webster, J. and Trougakos, J. P. 2012. Knowledge hiding in organizations. *Journal of Organizational Behavior* 33(1): 64-88.

Costas, J. and Grey, C. 2014. Bringing secrecy into the open: Towards a theorization of the social processes of organizational secrecy. *Organization Studies* 35(10): 1423-1447.

Dahlander, L. and Gann, D. 2010. How open is innovation? *Research Policy* 39(6): 699-709.

Delarue, H. and Lejeune, A. 2011. Managerial secrecy and intellectual asset protection in SMEs: The role of institutional environment. *Journal of International Management* 17(2): 130-142.

Dougherty, D. 2001. Reimagining the differentiation and integration of work for sustained product innovation. *Organization Science* 12(5): 612-631.

Drazin, R., Glynn, M.A. and Kazanjian, R.K. 1999. Multilevel theorizing about creativity in organizations: A sensemaking perspective. *Academy of Management Review* 24(2): 286-307.

Epstein, R. 2004. The constitutional protection of trade secrets under the takings clause. *University of Chicago Law Review* 71(1): 57-73.

Gertner, J. 2014. The truth about google x: An exclusive look behind the secretive lab's closed doors. Fast Company [Online], http://www.fastcompany.com/3028156/united-states-of-innovation/the-google-x-factor. Last accessed 11.11.14.

Hannah, D. 2005. 'Should I keep a secret?' The effects of trade secret protection procedures on employees' obligation to protect trade secrets. *Organization Science* 16(1): 71-84.

Hannah, D. 2007. An examination of the factors that influence whether newcomers protects or share secrets of their former employers. *Journal of Management Studies* 44(4): 465-487.

Henkel, J. 2006. Selective revealing in open innovation processes: The case of embedded Linux. *Research Policy* 35(7): 953-969.

Henkel, J., Schöberl, S. and Alexy, O. 2014. The emergence of openness: How and why firms adopt selective revealing in open innovation. *Research Policy*43(5): 879-890.

Katila, R., Rosenberger, J.D. and Eisenhardt, K.M. 2008. Swimming with sharks: Technology ventures, defense mechanisms and corporate relationships. *Administrative Science Quarterly* 53(2): 295-332.

Knott, A.M. and Posen, H.E. 2009. Firm R&D behaviour and evolving technology in established industries. *Organization Science* 20(2): 352-367.

Kupferberg, F. 2006. Creativity regimes: Innovation norms and struggles for recognition in the early US car and film industries. *International Studies of Management & Organization* 36(1): 81-103.

Lampel, J., Honig, B. and Drori, I. 2014. Organizational ingenuity: Concept, processes and strategies. *Organization Studies* 35(4): 465-482.

Laursen, K. and Salter, A.J. 2014. The paradox of openness: Appropriability, external search and collaboration. *Research Policy*43(5): 867-878.

Liebeskind, J.P. 1997. Keeping organizational secrets: Protective institutional mechanisms and their costs. *Industrial and Corporate Change* 6(3): 623-664.

Liebeskind, J.P. and Oliver, A.L. 1998. From handshake to contract: Trust, intellectual property and the social structure of academic research. In Land, C. and Bachmann, R. (Eds.): *Trust Within and Between Organizations*. Oxford: Oxford University Press, 118-145.

Martin, R., and Moodysson, J. 2013. Comparing knowledge bases: on the geography and organization of knowledge sourcing in the regional innovation system of Scania, Sweden. *European Urban and Regional Studies*20(2): 170-187.

Maskell, P. 2001. Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change* 10(4): 921-943.

Maurer, S.D. and Zugelder, M.T. 2000. Trade secret management in high technology: A legal review and research agenda. *Journal of High Technology Management Research* 11(2): 155-174.

Michel, A.A. 2007. A distributed cognition perspective on newcomers' change processes: The management of cognitive uncertainty in two investment banks. *Administrative Science Quarterly*52(4): 507-557.

Michel, A.A. 2014. The mutual constitution of persons and organizations: An ontological perspective on organizational change. *Organization Science*25(4): 1082-1110.

Perlow, L.A. and Repenning, N.P. 2009. The dynamics of silencing conflict. *Research in Organizational Behavior*29: 195-223.

Perry-Smith, J.E. 2006. Social yet creative: The role of social relationships in facilitating individual creativity. *Academy of Management Journal* 49(1): 85-101.

Perry-Smith, J.E. and Shalley, C.E. 2003. The social side of creativity: A static and dynamic social network perspective. *Academy of Management Review* 28(1): 89-106.

Rich, B. and Janos, L. 1994. *Skunk Works: A Personal Memoir of My Years at Lockheed.* Boston, MA: Little, Brown and Company.

Scheppele, K.L. 1988. *Legal Secrets. Equality and Efficiency in the Common Law.* Chicago: Chicago University Press.

Stead, R.S. and Cross, A.R. 2009. The management and security of trade secrets: An exploratory study. *International Journal of Intellectual Property Management* 3(3): 256-277.

Storper, M. and Venables, A.J. 2004. Buzz: Face-to-face contact and the urban economy. *Journal of Economic Geography* 4(4): 351–370.

Swedberg, R. 2003. The case for an economic sociology of law. *Theory and Society32*(1): 1-37.

Teece, D.J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public Policy. *Research Policy* 15(6): 285-305.

Wang, S. and Noe, R.A. 2010. Knowledge sharing: A review and directions for future research. Human Resource Management Review 20: 115-131.

Title: Providing structure to facilitate creativity

Ironically, although the saying goes that necessity is the mother of invention, coming up with novel ideas is easier when one is striving for positive outcomes and improvement (approach motivation) rather than when one is striving to avoid negative outcomes and failure (avoidance motivation) (Mehta & Zhu, 2009; Roskes, De Dreu, & Nijstad, 2012). Avoidance motivation is paired with anxiety and a careful, systematic way of thinking which makes it difficult to explore new, potentially risky, ideas and think associatively. In other words, when creative ideas are most urgently needed, they are less likely to appear. Here, we tested whether providing task structure enhances creativity for people high in avoidance motivation.

Task structure. People tend to think of creative processes as random, unpredictable, and requiring the absence of external constraints. The idea that creativity is an associative process requiring flexibility and defocused thinking is reflected in lay beliefs, and resonates in scientific research (Lucas & Nordgren, 2015). Compared to "regular" problem-solving tasks, creative tasks are assumed to rely more on disorganized processes. External constraints limit attention scope, cognitive flexibility, and the experience of autonomy and therefore reduce creativity (Hennessey & Amabile, 2010). By contrast, structure and organization often result in more conventional ideas (Lindskog, Hemphälä, & Eriksson, 2017; Nouri, Erez, Rockstuhl, Ang, Leshem-Calif, & Rafaeli, 2013). Structure is often only recommended during the later stages of innovation processes in which ideas are selected and implemented (West, 2002).

However, structure and external constraints can be beneficial for several reasons, even in the early, exploratory idea-generation phase. First, sometimes constraints are experienced as challenges, which increase intrinsic motivation (Eisenberger & Rhoades, 2001). Second, creative tasks are cognitively demanding, and constraints and structure may help people to

focus their resources effectively (Roskes, 2015). Third, flexibility and lack of structure may increase the number of generated ideas, but not necessarily their quality. Structure and clear problem definitions provide direction and make idea generation more effective (Ward, 2004). Particularly for people high in avoidance motivation, providing task structure could be beneficial because it enhances clarity and thereby reduces anxiety, helps them to focus their resources in an efficient way, and increases intrinsic appeal because structured tasks fit their systematic way of thinking.

Method. In two experiments, individual differences in approach and avoidance motivation were measured and students worked on a creative task with or without task structure. In experiment 1, 92 students made a drawing of an alien with or without a step-by-step plan. Providing structure did not influence creativity ratings of the drawings, but increased task enjoyment for people higher in avoidance motivation. In experiment 2, 100 students wrote a 500 word proposal for an intervention to relieve the negative consequences of the refugee crisis. All students had 8 minutes to prepare the assignment, but only half of them were instructed to make a structured outline. Starting by making an outline led to higher grades for the proposals of students higher in avoidance motivation. The outline did not influence clarity or feasibility, but increased the originality of the proposals for those higher in avoidance motivation.

Conclusion. The popular notion is that creativity requires inhibited thinking and is obstructed by external constraints and structure. However, this notion is not always correct. When applied correctly, structure improves creativity. For people high in avoidance motivation creative tasks are out of character, stressful, and difficult. Task structure reduces these hindrances and liberates people high in avoidance motivation to think creatively.

References

Eisenberger, R., & Rhoades, L. (2001). Incremental effects of reward on creativity. *Journal of Personality and Social Psychology*, *81*, 728.

Hennessey B.A., & Amabile T.M. (2010). Creativity. *Annual Review of Psychology, 61*, 569–598.

Lichtenfeld, S., Elliot, A.J., Maier, M.A. & Pekrun, R. (2012) Fertile green: Green facilitates creative performance. *Personality and Social Psychology Bulletin, 38*, 784–97.

Lindskog, P., Hemphälä, J., & Eriksson, A. (2017). Lean tools promoting individual innovation in healthcare. *Creativity and Innovation Management, 26*, 175-188.

Lucas, B.J., & Nordgren, L.F. (2015). People underestimate the value of persistence for creative performance. *Journal of Personality and Social Psychology*, *109*, 232-243.

Nouri, R., Erez, M., Rockstuhl, T., Ang, S., Leshem-Calif, L., & Rafaeli, A. (2013). Taking the bite out of culture: The impact of task structure and task type on overcoming impediments to cross-cultural team performance. *Journal of Organizational Behavior, 34*, 739-763.

Roskes, M. (2015). Constraints that help or hinder creative performance: a motivational approach. *Creativity and Innovation Management, 24*, 197–206.

Roskes, M., De Dreu, C.K.W., & Nijstad, B.A. (2012). Necessity is the mother of invention: Avoidance motivation stimulates creativity through cognitive effort. *Journal of Personality and Social Psychology, 103*, 242-256.

Ward, T.B. (2004). Cognition, creativity, and entrepreneurship. *Journal of business venturing, 19*, 173-188.

West, M. A. (2002). Sparkling fountains or stagnant ponds: An integrative model of creativity and innovation implementation in work groups. *Applied Psychology: An International Review, 51*, 355-387.