



# Curiosity and curious search in Entrepreneurship

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## ABSTRACT

Entrepreneurship research rarely explores and explains how people approach ambiguity differently as they combine knowledge during the entrepreneurial journey. In this paper we introduce curiosity as a source of intrinsic motivation that addresses this shortcoming. We find that the full range of curiosity-driven entrepreneurial behaviour is not well-described by terminology found within the curiosity literature, such as ‘specific curiosity’ or ‘diversive curiosity’, which have characterized curiosity according to excessively ‘configurational’ mixes of features. For that reason, we develop a new classification system based on behaviour. By focusing on three dimensions – the approach towards ambiguity, emotional valence, and experimentation versus theorization – we develop a unique 3 × 2 typology of ‘curious search’. The six forms of curious search – tweaking and sleuthing (what we call ‘clarifying’ types of curious search), spelunking and stargazing (‘adventuresome’ types), and fiddling and wool-gathering (‘bored’ types) – are described and illustrated in a variety of entrepreneurship situations, and are also shown to apply to a variety of existing entrepreneurship research topics, especially entrepreneurial imagination.

## ARTICLE HISTORY

Received 21 August 2023  
Accepted 30 April 2024

## KEYWORDS

Curiosity; epistemic emotion; ambiguity; exploration; alertness; boredom; adventure; problem-solving

## 1. Introduction

Brian Chesky and Joe Gebbia met when they were design students at the Rhode Island School of Design. Although they initially went their own ways after graduation, they eventually decided to move into a 3-bedroom apartment together in San Francisco, with the idea of starting a company. They could not afford to rent it long-term, so they had to find a solution to pay the rent. One weekend, a big design conference was coming, and the event would be attracting thousands of designers to the city and filling hotels to capacity. Chesky would later be quoted as saying in an interview ‘... At that point, we just had this idea ... *what if* we just created a bed and breakfast for the design conference?’ (Greylock 2015). In the beginning, it was just speculation. Soon after, before joining Y Combinator, no investor had been willing to invest in them at a \$1.5 million-dollar post-money valuation (This Week in Startups 2023). Little did they know that twelve years later, their company Airbnb would debut on the Nasdaq and reach \$100 billion dollars on its first trading day. How did the co-founders initially search out this multi-billion-dollar idea?

In entrepreneurship research, gaps remain in our understanding of the concept of search (Foss and Klein 2012). In one scenario, people deliberately scan across existing information, inadvertently stumbling upon opportunities even though they had no such intention. Such so-called ‘undirected search’ (Barreto 2012) includes broad scanning like reading (Kaish and Gilad 1991), general

information search like using professional networks (Cooper, Folta, and Woo 1995; Ucbasaran et al. 2008), and constrained systematic search like utilizing known sources (Fiet 2007; Patel and Fiet 2009). In another scenario, under ‘directed search’, people know what they are looking for, they have convinced themselves that a product can be developed to solve a problem, and they just have to find the right features and figure out how to manufacture it. A third search process falling in between these two ‘involves that **surprise** which accompanies the realization that one had **overlooked** something in fact **readily available**’ (Kirzner 1997, 72, emphases added). We do not know why or how some seem to discover what is around the corner before others do (Kirzner 1983, 9), much less address how the ‘ability to **learn without deliberate search** is a gift individuals enjoy in quite different degrees’ (1983, 148, emphasis added). While individual competencies lead some to take chances despite unclear odds (Kihlstrom and Laffont 1979), less clear is how people differentially approach ambiguity in general as they uncover information. One distinction lies in how much they are intrinsically motivated by the mere uncovering of that information or more specifically their willingness to be *curious* in the first place.

Such curiosity can be an antecedent of entrepreneurial action (e.g. Lerner et al., 2018). Entrepreneurial Action Theory (EAT) argues that rational and non-rational action in the face of uncertainty (Angus, Packard, and Clark 2022; Hunt et al. 2022; Wiklund et al. 2018) leads to different forms of entrepreneurial opportunity (Alvarez and Barney 2007); suggests that cognitive differences in opportunity perception, perhaps via expertise and experience (McKelvie et al. 2011), can influence actions taken (Gaglio and Katz 2001); and recognizes the importance of adaptability, motivation and willingness to bear uncertainty in the action-taking process (Eshima and Anderson 2017; McMullen and Shepherd 2006). At the same time, humans need not always have a vision of entrepreneurial success before they act. Action, driven by pure curiosity, can come before entrepreneurial intent or the uncovering of an entrepreneurial opportunity.

To explore such an intrinsic motivation to search, we consider that concept of curiosity, defined as a motivational state that activates individuals’ exploratory intention and behaviour to confront uncertainty and make sense of the world (Berlyne 1978; Loewenstein 1994). Curiosity research can describe a person’s interest in seeking ambiguity, while also accounting for their desire to reduce or eliminate ambiguity (Budner 1962). While research distinguishes between specific curiosity (knowledge-deepening experimental efforts to solve a problem) and diversive curiosity (knowledge-broadening efforts not directed at solving a problem), little room is afforded for considering curiosity driven by knowledge-deepening theorization for solving problems or knowledge-broadening experimentation unintended for addressing any problem. Thus, in our paper, we seek to develop a theory of curiosity more appropriate for the entrepreneurship context. We combine ‘search’ and ‘curiosity’ to derive a framework for ‘curious search’, which we describe as ‘a toolset of experimental and theorizing processes that build upon each other, over time, to help explain how and why rarely explored yet useful information is uncovered and combined’.

In developing a theory of curious search for entrepreneurship we make some important contributions. First, by applying curiosity research to entrepreneurial search, we explicitly highlight the incentive, motivation, and satisfaction that people ascribe to **the mere uncovering of knowledge and knowledge recombinations**, thus dismissing the necessity of always knowing what one searches for, or how it could be useful. Sometimes the entrepreneur’s curiosity in experimenting with and theorizing about the combination and assembly of resources or assets can be enough to jumpstart the entrepreneurial process, just like in the Airbnb case described. Secondly, we explain how curious search can frame a broad toolset, combining cognition and affect, to generate an individualized approach to ambiguity for each entrepreneur. Search is conducted not simply for economic reasons or driven merely by information processing but is also an emotionally/affectively oriented activity. Thirdly, we highlight how *curiosity can differentially serve to stimulate recombinant search*, leading to innovative action or entrepreneurial thinking, via distinguishing between ambiguity-reducing, ambiguity-embracing, adventure-seeking, and boredom-induced behaviours. As we will show, our framework contrasts with oft-researched topics such as creativity, experimentation

and imagination (Hennessey and Amabile 2010; Long 2014; Mynbayeva, Vishnevskay and Sadvakassova 2016; Raidl and Lubart 2001; Reiter-Palmon 2011; Silvia et al. 2012).

The paper proceeds as follows. We position the concept of curiosity within entrepreneurship and then discuss how current frameworks within curiosity research can be problematic for describing entrepreneurial behaviour. We introduce our 3 × 2 typology of curious search based on what we call clarifying search, adventuresome search, and bored search; and describe how these various modalities are reflected in early stages of entrepreneurship. Before concluding, we explain how the concept of curious search can be further applied in entrepreneurship research.

## 2. Curiosity and entrepreneurship

Entrepreneurship is driven by change and uncertainty (Lachmann 1956). This continual change and uncertainty open the door for ignorance, especially regarding the future and its economic transactions (Casson 1982). Insofar that people are boundedly rational (Simon 1955) and knowledge is dispersed heterogeneously across the population (Hayek 1948), sheer ignorance (Kirzner 1997) becomes increasingly salient. Under these conditions, entrepreneurs start projects without knowing the precise probabilities of the outcomes of those projects. According to Foss and Klein (2012, 58), it is such outcomes from (prior) entrepreneurial activity that systematically *'alleviate our ignorance about what we don't know'*.

### 2.1. Defining curiosity

Curiosity can also step in to begin the process of alleviating that ignorance about what we do not know. It is conceptualized as a competency or trait characterized by the active desire for new information, understanding, meaningfulness, knowledge, experiences, or sensory stimulation in order to resolve gaps or experience the unknown, engendering inquisitive and exploratory behaviours (Berlyne 1978; Harrison, Sluss, and Ashforth 2011; Loewenstein 1994).<sup>1</sup> While some have framed curiosity as emerging from a trait manifested through stable individual differences (Hassan, Bashir, and Mussel 2015), others frame it as a competency capable of development or re-development through learning or practice (Handin and Steinwedel 2006; Koranda and Sheehan 2014; Sekerka et al. 2014; also see Lackéus 2014). Sekerka et al. (2014, 711) define curiosity as *'a managerial competency, entailing the acquisition and use of knowledge, taking an interest in a given experience and engaging in additional exploration and discovery'*. Koranda and Sheehan (2014) remark that *'while every human is theoretically born curious, for various reasons we often lose the ability to be curious as we grow'*. How people differentially think and solve problems, especially those involving skills that can be acquired and learned, has also been shown to correlate with curiosity (Litman and Spielberger 2003). Within Kirzner's concept of entrepreneurial alertness, the notion of curiosity offers a more control-oriented explanation for discovering the information and opportunities that others fail to perceive, which can be captured by Holcombe's (2003, 36) example of people scavenging with metal detectors on a beach.

Consider Amazon, which was facing challenges related to its own software projects in the early 2000s, primarily because they required efficient storage and database solutions. Developing and maintaining these systems was taking a lot of time and resources. Around the same time, Amazon had opened up its platform to external developers by providing Application Programming Interfaces (APIs) that allowed developers to interact with and utilize Amazon's infrastructure and services. These APIs enabled developers to access Amazon's e-commerce features, including product data, customer reviews, and more. Thousands of developers started using these APIs for various purposes, not just e-commerce. Amazon decided to try providing a wide range of cloud computing services, including storage, databases, computing power, and more, to enable developers and businesses to build scalable applications. As Jeff Bezos himself mentioned in retrospect, *'No one asked for [what came to be called Amazon Web Services]*. No one. Turns out the world was in fact ready and hungry

for an offering like AWS but didn't know it. We had a hunch, *followed our curiosity*, took the necessary financial risks, and began building – reworking, experimenting, and iterating countless times as we proceeded' (Entrepreneur magazine 2018).

## 2.2. Curiosity, ambiguity, and serendipity

While curiosity can apply to complexity and uncertainty, we consider curiosity to be particularly relevant to ambiguity. Townsend et al. (2018, 660) refer to ambiguity as characterizing situations where *'it is impossible to discern what is important or even what is going to happen'*. We assert that this is precisely where curiosity becomes salient: curiosity helps to uncover what is hidden yet interesting (or meaningful). Consider the glue developed by 3M's Spencer Silver. It was intended to be a super-strong adhesive but instead ended up being weak and pressure-sensitive. While securing notes in his hymn book one day, his colleague Art Fry re-considered the ambiguity of the meaning or usage of that odd adhesive. Even though his initial attempts indeed left troublesome adhesive on the pages, curiosity still led Fry to invent the Post-it Note and create the sticky note market (which in 2022 was worth \$2.1b) (Petroski 1992).

We see curiosity as a critical competence that interacts with serendipity on the way to experimentation (see Björklund et al. 2020; Busch 2022). The history of Play-doh is illustrative. The company Kutol had manufactured a compound for cleaning wallpaper, but demand for its product disappeared in the 1950s as households went from heating with dirtier coal to cleaner oil, gas, and electricity. Joe McVicker was tasked with turning Kutol around, and learned from his sister-in-law that kids found modelling clay too hard to manipulate and that she had successfully tested the squishy cleaning product with her nursery school students. While some might say that such a discovery was merely accidental or serendipitous, a curiosity-driven recombinant search was ultimately required here to repurpose a family firm's failing product for a completely different and new market, spinning off into a new company called Rainbow Crafts in 1956. By 2015, more than 3 billion cans of Play-doh had been sold. In spite of the relevance of curiosity to search and serendipity, how curiosity is conceptualized and categorized in the literature is not well-suited to help address entrepreneurship phenomena, as we explain next.

## 2.3. Categories of curiosity in the literature

Some forms of curiosity are central in the literature. Specific curiosity is defined by the intense desire for explanations or pieces of information for the purpose of reducing uncertainty or ambiguity (Berlyne 1978). It is often associated with experimentation and the exploration of multiple possibilities that might solve different aspects of an unsolved puzzle or problem (Hardy, Ness, and Mecca 2017; Loewenstein 1994; Simon 2001). It is also associated with changes in immediate surroundings and described as driven by or leading to the development of perceptions of competence and mastery (Litman 2005, 2008; Litman and Jimerson 2004; White 1959). Specific curiosity often provokes hard work and persistence in the form of intellectual engagement (Litman and Mussel 2013) and intellectual inquisitiveness (Powell et al. 2016). It is, therefore, a directed or 'purposeful' form of exploration (Simon 2001; Spielberg and Starr 1994; Stigler 1961).

Contrary to specific curiosity, diversive curiosity is defined by a desire to learn more generally, seeking out unfamiliar topics and varied sources of novelty regardless of the source of information (Harvey et al. 2007). Here, the approach towards ambiguity is one of tolerance or even the seeking of it. For Chesky, that Airbnb co-founder, a key part of the artistic spirit is curiosity. In an Inc. magazine (2022, emphasis added) interview, he remarked 'I think the challenge as an adult is to *remain curious* ... In entrepreneurship and design, you have to be curious, because you always have to keep your mind open to the next big idea, to the next big innovation'. Consider though, that some researchers have pointed to boredom (and then escape or avoidance thereof) as the stimulus of this form of curiosity (Berlyne 1978), while others have highlighted general individual growth that comes

from self-challenge, for example reading about a new subject because it merely captures one's attention (Kashdan and Silvia 2009). Individuals with strong dispositional tendencies towards diverse curiosity are attracted to a broad array of novel stimuli. In contrast to specific curiosity, the point is to use curiosity as a new way of framing situations. Diverse curiosity thus involves seeking out additional sources of ambiguity and novelty within newly encountered contexts and experiences.

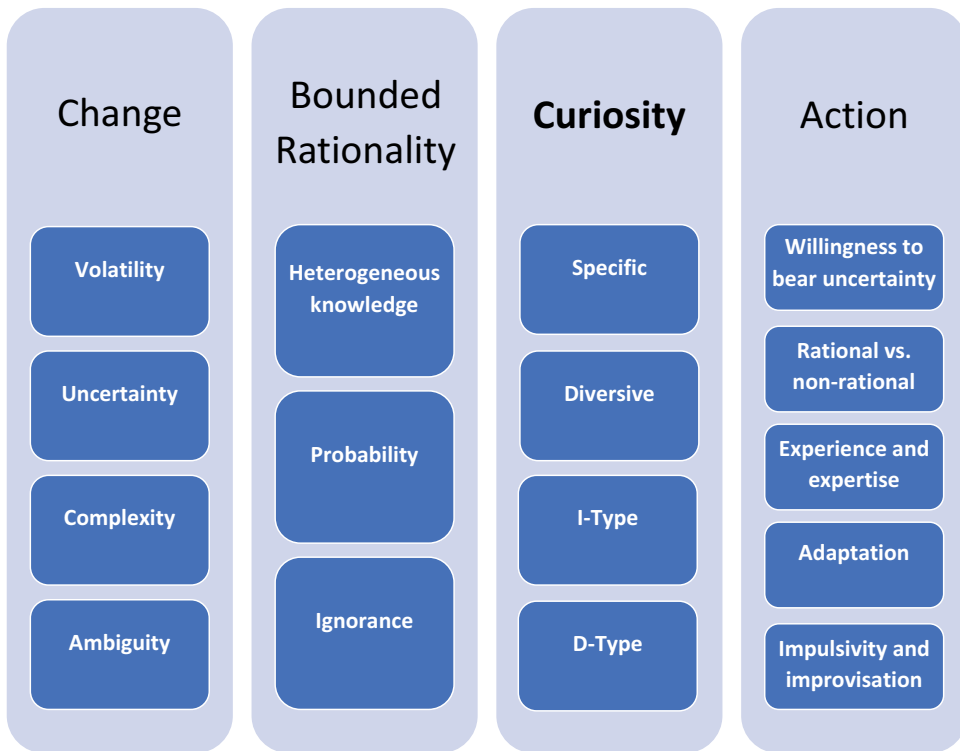
While a distinction between specific vs. diverse curiosity generally pinpoints the nature or purpose of any newly acquired information, another more recent categorization looks at the accompanying emotional states (Litman and Jimerson 2004). Interest-type (or 'I-type') curiosity corresponds to the intrinsic pleasure of learning, for example reflected by feelings of enjoyment or excitement, and thus is characterized by intellectual exploration stimulated by the anticipation of fresh, new or novel discoveries (Litman 2005). I-type curiosity can relate to seeking out novelty or closely examining a specific stimulus (e.g. 'I like to go somewhere different nearly every day'). Unsurprisingly, I-type curiosity is often viewed as correlated to diverse curiosity (Litman 2005). In contrast, deprivation-type (D-type) curiosity emerges when people identify a knowledge gap that generates a feeling of ignorance. They seek information to escape an uncomfortably intense frustration of not knowing and an accompanying 'need to know'. The difference between D-type and I-type curiosity research is that proponents of interest-based theories believe that the feelings associated with the arousal of curiosity are rather pleasant, whereas deprivation-type theories remark that this arousal is unpleasant.

#### **2.4. Difficulties importing curiosity literature into entrepreneurship**

We assert that entrepreneurial behaviour is not well-described by terminology such as specific versus diverse curiosity, insofar that the curiosity literature often conceptualizes those terms with excessively 'configurational' mixes of features. For example, specific curiosity is regularly tied more directly to experiencing physical sensations, as when people want to know more about how a complicated piece of machinery works; and especially for the purpose of solving problems, puzzles or riddles (Litman and Spielberger 2003; Mussel 2013). Specific curiosity tends to be associated with refining or extending trial-and-error and thus involves knowledge-deepening or narrow kinds of directed search (Loewenstein 1994). In contrast, diverse curiosity is associated with scanning the environment and information gathering (Day 1971; Litman and Spielberger 2003). Naturally then, it tends to be associated with attention towards broad far-flung topics.

Of course, such configurations need not hold in entrepreneurship. Experimentation to solve a problem does not necessarily involve incremental adjustments and the marginal effort to acquire knowledge used to solve a problem need not be associated with depth of information or knowledge (Lazear 2004). Specific curiosity, it seems, does not generally distinguish between those directed efforts for solving problems using theory, versus those efforts to solve the same problems via experience or experimentation. Entrepreneurs are instead well-known for 'thinking out of the box' to solve problems in clever ways. Furthermore, entrepreneurship is an interdisciplinary endeavour where it can be difficult to distinguish between precisely what is knowledge-deepening search versus what is knowledge-broadening search. For example, when Joe McVicker invented Play-doh, is that knowledge-deepening because he is finding new uses for the same product or knowledge-broadening because he is exploiting a new market?

Instead, the entrepreneurial search for solutions to solve a consumer problem can involve both trial-and-error experimentation and heuristic (or 'cognitive') search (e.g. Hsieh, Nickerson, and Zenger 2007; Levinthal 1997); thus, scanning the environment can serve to solve a problem, with intention. By itself, however, the curiosity literature rarely talks about how curiosity is used to help solve specific problems via information gathering, or how it is used in trial-and-error via exploring across far-flung domains. While such curiosity-driven behaviour may not be typical in routine daily life, they are readily relevant in the entrepreneurial context.<sup>2</sup> Furthermore, if diverse curiosity serves to explore situations that are new, complicated, and have a high degree



**Figure 1.** Conceptual foci for curiosity, compared to other entrepreneurship theory contexts.

of uncertainty (Mussel 2013), and specific curiosity is what we use when solving problems, then how do we describe what is used to solve a novel (entrepreneurial) problem? Describing the entrepreneurial problem-solving process in terms of specific versus diversive curiosity thus becomes particularly unwieldy.

In fact, some research does begin to blur the line between specific curiosity and diversive curiosity. Hagtvedt et al. (2019), for example, remark that '*specific curiosity drives individuals to seek out information that goes beyond what is needed to solve the puzzle that initiated the search*' (also see Feldman and March 1981; Loewenstein 1994; Strull et al. 1984). If high degrees of novelty, complexity or ambiguity are encountered during ongoing problem-solving amid a volatile environment, then it becomes confusing which type of curiosity we should say is being applied. Figure 1 shows the focus in curiosity literature compared to foci in other entrepreneurship-related contexts.

### 3. Curiosity and curious search

In place of fixating on terms such as specific versus diversive curiosity, we focus on different modes of curiosity-driven search or what we call 'curious search' (i.e. a behaviour). Making this adjustment offers a few advantages. First, there arise scenarios where entrepreneurs must tackle problems that are changing quickly, and it becomes difficult to say whether specific or diversive curiosity is in play. Secondly, a notion of curious search suggests that people can indeed search for something vague or indeterminate without knowing what they are looking for. One can still 'search' before encountering serendipity and realizing an 'ah-ha' moment (Dew 2009). Thirdly, because some of the literature has begun to explore the management of curiosity (Harrison, Sluss, and Ashforth 2011), introducing and developing a concept of curious search opens the door for explaining how groups or teams of entrepreneurial actors combine their curiosity during search.<sup>3</sup>

We see the use of curiosity during search as being valuable in the earliest moments of what becomes entrepreneurship, potentially even before intentions to start a venture. Then, afterwards, entrepreneurs may encounter a phase where decisions are rather basic, and the institutional environment is well-developed enough to give entrepreneurs some confidence. As more knowledge domains are added into the analysis and as environmental uncertainty increases, difficulty in decision-making is exacerbated. The chances that an entrepreneur has any significant understanding of them starts to decrease dramatically. Irregularities or complexities of the problem at hand may be encountered, whereupon curiosity becomes more valuable to explore the problem in a deeper way. In this kind of situation, entrepreneurs must engage in curious search, either via new logic and theory, or taking new stabs at trial-and-error. Note that our notion of curious search involves a dose of one's interest in combining knowledge combinations, whereas 'blind search' has no such characterization.

Just as we do not equate curiosity to creativity or experimentation, we also do not exactly equate the concept of curious search to those concepts. Creativity, by definition, involves novelty; curious search has no such requirement. Certainly, creative people are likely curious and also engage in curious search, but not all curiosity necessarily leads to creativity. Consider also that experimentation often involves the generation of hypotheses and expectations. While both technical and market experimentation are valuable in the context of entrepreneurship (Lindholm-Dahlstrand et al. 2019), insofar that they occur as part of formal research or venturing within organizations (Carlsson et al. 2009), they often take the form of calculated risks based on expected success. In those contexts, determination of only the mere identity of an outcome is not valuable enough to induce search. However, in a world characterized by uncertainty, curious search can be what motivates and initiates the entrepreneurial actions '*nobody can see coming*' in the face of ambiguity and uncertainty (Angus, Packard, and Clark 2022).<sup>4</sup>

We see curious search as a specific form of exploring. First and foremost, curious search explicitly and necessarily ignores or dismisses the relevance of estimating the values of knowledge combinations and recognizes differential motivation driving the different behaviours reflecting curiosity. While exploration *could* involve estimating the value of knowledge combinations *a priori*, curious search does not. Also note that we do not wish to couch curious search as inapplicable or irrelevant to exploitation, in either the 'exploration-exploitation' sense or the 'opportunity exploitation' sense. As Lavie et al. (2010, 115) point out, within a firm, one organizational subunit's exploration may be considered an adjacent organizational subunit's exploitation. Certain knowledge, technology, or markets may be new to one organization but familiar to another. Our term 'curious search' does not require or necessitate recognizing any distinction between 'exploration' versus 'exploitation'. Along the same lines, regardless of 'where opportunity discovery ends and opportunity exploitation begins', we conceive curious search as always an available option.

Based on our review of specific versus diversive curiosity, we highlight three dimensions: whether curious search is used for the purpose of reducing ambiguity or tolerating/seeking additional ambiguity, whether search involves positively or non-positively valenced affect, and whether it involves experimental trial-and-error or cognitive theorization. Figure 2 shows how these three dimensions deliver a 3 × 2 typology of curious search, comprised of what we call tweaking, sleuthing, spelunking, stargazing, fiddling, and wool-gathering.

### 3.1. Clarifying experimentation ("tweaking" or "rummaging")

The entrepreneur can mobilize curiosity to help solve an entrepreneurial setback (i.e. a problem) via trial-and-error and testing. She has an idea of the type of solution she wants but is not sure about the steps required to obtain the outcome. This kind of curious search propels individuals down multiple pathways as they seek to 'solve the puzzle', leading them to encounter ideas that are loosely related to the puzzle and to each other. Clarifying experimentation, or 'tweaking', fills in knowledge gaps, potentially encouraging refinements in solutions and thus leading to better and more creative

	<b><u>Experimentation</u></b> (i.e. trial-and-error)	<b><u>Theorization</u></b> (i.e. from theory)
<p><b><u>Clarifying:</u></b> Ambiguity-reducing</p> <p><b>(for the purpose of solving a given problem)</b></p>	<p>Clarifying experimentation</p> <p><i>“Tweaking” or “Rummaging”</i></p>	<p>Clarifying theorization</p> <p><i>“Sleuthing”</i></p>
<p><b><u>Adventuresome:</u></b> Ambiguity-tolerant and positively valenced</p> <p><b>(intending to explore beyond a given problem)</b></p>	<p>Adventuresome experimentation</p> <p><i>“Spelunking”</i></p>	<p>Adventuresome theorization</p> <p><i>“Stargazing”</i></p>
<p><b><u>Bored:</u></b> Ambiguity-tolerant and non-positively valenced</p> <p><b>(with neither intention to explore nor solve a problem)</b></p>	<p>Bored experimentation</p> <p><i>“Fiddling”</i></p>	<p>Bored theorization</p> <p><i>“Woolgathering”</i></p>

Figure 2. Typology for curious search.

alternatives. Here, the entrepreneur’s curiosity is driven not only by the mere uncovering of valuable information but also by the desire for expertise. Notably, clarifying experimentation relates most closely to the kind of D-type curiosity described earlier, where people exhibit curiosity for the purpose of reducing feelings of frustration from not knowing something. Expanding on Simon’s (2001) concept of the role of hypotheses in curiosity, entrepreneurial tweaking is controlled (i.e. it involves the consideration of hypotheses) while rummaging is uncontrolled (i.e. it involves little to no consideration of hypotheses).<sup>5</sup> A good example distinguishing tweaking from rummaging comes from Safi Bahcall, a co-founder of Synta Pharmaceuticals, who remarked:

When you focus on the right questions and get curious about the questions, you can start to uncover something very interesting . . . So, you start to ask the folks that you work with, whether it’s your teams or other business leaders, not just ‘How are you going to solve this problem?’ but ‘What experiments might you run? What hypotheses can you test, and how can you test them as creatively and as efficiently as possible?’. (Medium, 2021)

### 3.2. Clarifying theorization (“Sleuthing”)

In solving a particular problem, and when decisions are heavily interdependent to the point where swapping out the choice for one decision destroys the value of the choices made for the rest of the decisions, it can become prohibitively difficult to guess which choices should be combined. Other kinds of curious search behaviour might be more useful. Instead of experimenting via tweaking or



rummaging to solve managerial problems, the entrepreneur may engage in sleuthing different theories or principles to guide curious search. Again, the purpose here is to reduce ambiguity, whether or not that is the actual effect.<sup>6</sup>

A good example of what we call sleuthing comes out of Pat Brown's experience as founder of Impossible Foods. In a fireside chat, he has been quoted as remarking that *'the most important skill is the determination to solve a problem'* and *'my professional responsibility was to follow my curiosity'* (Newton Lecture Series 2021). For him, the problem was how to develop a sustainable, scalable food solution from plant extracts that match the specific kinds of biochemical, biophysical specifications that are required to produce the textural property, juiciness, cooking behaviour, flavour chemistry, and so forth for animal-based foods. His team's research theorization identified the molecule heme, which is the molecule that makes our blood red, carries oxygen in our blood, and is also essential for every living cell because it is part of the way cells generate energy (Berkeley Sutardja Center 2021; Stanford e-Corner 2017). They did not know whether such a molecule meeting their requirements existed and yet their curiosity propelled them to continue searching.

Only considering ambiguity-reducing forms of curious search during problem-solving, however, risks overlooking the potential utility of ambiguity-tolerant forms of search. In entrepreneurial and creative problem-solving, details regarding the problem at hand often start out not only as complex but also ambiguous. The effort to reduce ambiguity while solving problems is not always productive. Entrepreneurs may find that their directed experimentation or theorization is unproductive. In this case, curious search may switch from ambiguity-reducing to ambiguity-tolerant (or even ambiguity-seeking). The ambiguity-tolerant forms of search could involve examining totally unrelated domains with an intention to acquire new knowledge but without any expectation or hope that it will be useful for any problems at hand. Hardy et al. (2017, 235), for example, refer to diversive curiosity as *'aimless and hedonistic in nature'*. Here, curiosity primes individuals to adopt a broad focus of attention that facilitates breadth in information seeking and a cognitive emphasis on global information processing that is fundamental to idea generation. Ambiguity-reducing or ambiguity-tolerant forms of search are more specific than the broader notions of scanning or 'exploration'. Unfortunately, the concept of 'diversive curiosity' does not explicitly distinguish between efforts to use theory versus experience (i.e. experimentation), which leads us to making additional distinctions.

### 3.3. Adventuresome experimentation ("spelunking")

Diversive curiosity is linked to far-flung information gathering. Entrepreneurs often experiment to 'problematize' their broader world view, in other words seeking novelty for the purpose of altering assumptions, and making a mundane context appear more interesting (Getzels and Csikszentmihalyi 1976). During the earliest stages of the entrepreneurial process, employees may experiment with unfamiliar resources and asset attributes, meandering beyond a given problem to potentially identify a disruptive technology's benefits and ways to implement those. Here, adventure does not necessarily denote exploring entirely new landscapes; instead, it mainly refers to ambiguity-seeking or tolerance. Once again, curiosity drives the effort associated with experimenting emotionally in adventuresome ways.

Spelunking may involve behaviours that appear like 'play' but it should not be confused as such. In contrast to adventuresome experimentation, play has broader attitudinal and social consequences (Petelczyc et al. 2018). Van Vleet and Feeney (2015, 640) define 'play' as *'an activity or behavior that (a) is carried out with the goal of amusement and fun, (b) involves an enthusiastic and in-the-moment attitude or approach, and (c) is highly interactive among play partners or with the activity itself'*. Spelunking certainly does not require the first of these three components, although it may include the latter two. Finally, while the concept of 'play' could include a game of basketball in an interoffice competition or challenging one's boss to a video game during lunch breaks, these examples are generally not characterized at all by any deliberate experimentation.

Spelunking is a behaviour that can lead to the formation of a startup, or it can lead to precisely nothing. Charles Ofori Antipem, a co-founder of a hardware start-up called Dext Technology based in Ghana tells the story of when he recruited his mother to help satisfy his curiosity with what he calls a ‘*crazy experiment*’: lighting a coal fire so he could boil a cassava to extract starch to build a prototype of a laser-based smoke detector (International Trade Center 2018). Yet, spelunking is something that entrepreneurs can do, even after they have launched. David Arnoux, a serial entrepreneur and current co-founder of Growth Tribe, is quoted as advocating ‘staying extremely curious’ (EHM 2019). During one self-proclaimed ‘crazy experiment’ during launch, his digital corporate training company, now selling to various firms ranging from LinkedIn to TomTom to P&G, gave expensive programmes away to customers for free, hoping that they would be able to convert people after the giveaway. Their training programmes run around 1000 euros for 10–24 hours of instruction, and they experimented with teaming up with co-working spaces to repackage those digital courses and certificate programmes into 1-hour teasers called ‘power sessions’.

### 3.4. Adventuresome theorization (“stargazing”)

We acknowledge that adventure need not be restricted to action alone. Entrepreneurs may also explore radically novel ideas (T. M. Amabile 1988) heuristically. This is not the same as play and we aim to expand beyond the matter of imagination or daydreaming fictional events (e.g. Gartner 2007; Sarasvathy 2002). Rather it is the emotionally-driven introverted use of imagination to develop theories for the purpose of seeking interesting information or knowledge *with no intent of reducing ambiguity of any problem at hand*. Felin and Zenger (2009, 128) refer to ‘entrepreneurial theorizing’, which allows entrepreneurs ‘*to learn and create far more than the direct application of their limited experience and observations should empirically permit*’. Namely, they point to how ‘*[e]xperiences and observations ... provide the triggering raw material from which the entrepreneurial possibility space is essentially bootstrapped, theorized and created*’ (Felin and Zenger 2009, 132). Adventuresome theorization might be exemplified by how, when a lifelong professional musician sees damaged fruit in the supermarket being sold at a severe discount, wonders to himself how it might be re-purposed in a way that creates more value. Completely new thoughts, and new imagined futures and future scenarios are generated (Block 1981; Lewis 1986) in a low-cost way. More importantly, this kind of curiosity and curious search may be so enjoyable for its own sake, that it is essentially deemed costless. Describing this kind of cognition in terms of ‘curious search’ highlights the intrinsic motivation behind that process (Komporezos-Athanasidou and Fotaki 2015; Thompson 2018a; Thompson 2018a).

Our notion of stargazing relates easily to the recent coverage of ADHD in entrepreneurship. People who exhibit behaviour associated with ADHD are more likely to have entrepreneurial intentions (Verheul et al. 2015). Though ADHD may hinder productivity in a work environment, in terms of ‘*in-role performance*’ (Halbesleben, Wheeler, and Shanine 2013), an ‘*uninhibited imagination*’ has been found conducive to creative thinking (Carson, Peterson, and Higgins 2003). Adults who exhibit behaviours associated with ADHD perform better at tasks that require divergent thinking (White and Shah 2006), demonstrate higher originality in performing tasks, and have a higher preference for generating ideas compared with idea clarification or idea implementation (White and Shah 2011).

Probably the greatest proponent of what we term stargazing is Bill Gates, who is consistently quoted as advocating a curious mind, e.g. ‘*For the curious learner, these are the best of times because your ability to constantly refresh your knowledge with either podcasts or lectures that are online is better than ever*’. He stresses the critical importance of curiosity as a framework for acquiring knowledge, and encourages people to pursue subject areas of history, science, and economics (Inc. magazine 2020). While mere scanning is about focusing attention to streams of externally-generated data or information, stargazing is motivated by the thrill of uncovering and imagining unfamiliar or strange

concepts, whereby the mere crossing or uncovering of that concept in one's own mind could satisfy curiosity.

### 3.5. Bored experimentation (“fiddling”)

Much research suggests that curiosity can also emerge from non-positively valenced forms of ambiguity tolerance. When boredom sets in, and the mind wanders, entrepreneurs may find their curiosity stimulated. Boredom is a functional emotion that *‘informs one of the presence of an unsatisfactory situation and, at the same time . . . motivates one to pursue a new goal when the current goal ceases to be satisfactory, attractive or meaningful’* (Elpidorou 2018). Eastwood et al. (2012) suggested that in the presence of inadequate external situations the bored individual may try to overcome such lack of exogenous engagement by exerting effort to maintain attention (Damrad-Frye and Laird 1989; Fahlman et al. 2013; Hamilton 1981; O'Hanlon 1981).

That effort could come in the form of curious search. Hunter et al. (2016) found that boredom proneness, after its shared variance with overall personality structure was partialled out, was a positive predictor of deprivation-type epistemic curiosity and exploration (Litman 2008). Van Aart et al. (2010) asked participants to play the role of Alice from Alice in Wonderland and found that the induction of boredom was followed by an increase of curiosity. In entrepreneurship, Dahlen et al. (2005) and Kass et al. (2010) show that boredom motivates individuals to search for situations that will alleviate their experience of boredom, even if such situations are risky or costly to them. Our notion of fiddling merely to determine the identities of outcomes, during and as a reaction to boredom, is particularly valuable.

Rhafaël Antonio is founder of a foodie platform in the Philippines called Tastecrib. Throughout his adult life he was nomadic and dabbling in a variety of occupations. After a stressful stint in the outsourcing industry in the Philippines, he moved to Canada where he worked as a gardener for a few months and then got a job in 2016 as a customer agent for a petroleum company. Interviewed for a profile with an expat magazine called The Filipino, he indicates that *‘born out of boredom’*, he became *‘curious to try new things’* and experiment, leading him to explore baking with an oven; until then his idea of baking was confined to making rice cakes in a steamer. Fast forward to Winter 2021, and he has commercialized more than 20 Filipino products for the European market, signed a cookbook deal, and signed two exclusive contracts with a food manufacturer (The Filipino 2021).

### 3.6. Bored theorization (“Woolgathering”)

A boredom-driven form of curious search may also involve information acquisition that supports happenstance sense-making. As Kets de Vries (2014, 7, emphasis added) remarks:

[B]oredom can be a prelude to something. It can be a trigger for **imagination** and creativity and is closely associated with expectation . . . It might indicate a desire to seek out new and potentially more interesting and stimulating avenues. Reframed differently, boredom can be seen as a liminal space, a critical resource that pushes us to seek the unfamiliar. Being bored can help us to develop a rich inner life and become more creative.

Researchers have theorized that boredom is a regulatory state that signals to the individual when his or her goals are no longer fulfilling and motivates the search for novel and/or meaningful projects (Bench and Lench 2013; Elpidorou 2014). We choose to label such theorization stimulated by boredom as *‘woolgathering’*, defined in dictionaries as *‘indulging in aimless thought or daydreaming’*.

Carlos Guzman is currently co-founder, CEO, and master brewer of El Paso Brewing Company, but before this, he had a foray into the biodiesel industry. He was having a conversation with a classmate named Larry, who was a big country music fan. Carlos Guzman, originally from Puerto Rico, did not know how to converse about country music, but he did know about Willie Nelson, and during the conversation Larry mentioned that he had read about how Willie Nelson was involved with a business venture turning oil into fuel. As Guzman describes in a 2010 interview, a few days after

that conversation, he explains how he was '*bored at work one day*', and curious enough to google '*biodiesel*'; as he remarks, '*it all started from there*' (Institute of Oral History 2010). For a decade, Global Alternative Fuels produced and distributed gasoline, biodiesel, and diesel fuels. This form of search differs from stargazing, insofar that the search was not spurred by adventurous thinking; and differs from the fiddling of bored experimentation, insofar that the search is conducted strictly in one's own mind. Another well-known story involves Dennis Crowley, who was bored working at Jupiter Research before becoming curious enough to explore the idea of a mobile social network that eventually became Foursquare (Schonfeld 2011).

### **3.7. Curious search and entrepreneurial judgement**

Overall, this 3 × 2 typology recognizes the 'peaks and valleys' of the experience within the entrepreneur's work-life (e.g. Schindehutte et al. 2006), with its intermittent episodes of problem-solving amid changes in volatility and lulls in activity. It also acknowledges the variability in (valence of) affect during the entrepreneurial process. In the early phase of the entrepreneurial process when an individual has only started to consider becoming self-employed or launching a startup, uncertainty is high and curiosity is relevant. Whether prospective entrepreneurs generate their ideas by looking for something specific, or while looking for something else, or even not looking for anything specific at all, aside from blind luck they will generally exercise curiosity. In their search for ideas and strategies (e.g. Agrawal, Gans, and Stern 2021), they often ask themselves what might happen if they create a certain product or service for a market. Curiosity can explain why some individuals are more likely to come up with novel or interesting ideas than others and why particular stimuli trigger search in some people and not others.

Curious search need not arise exclusively from efforts to stave off boredom or refine a solution to a known problem. Prospective entrepreneurs may engage in adventuresome search due to their interest in starting a new project involving unfamiliar domains, or in the process of grasping how a newly inherited resource could be leveraged in commercialization, or as they stargaze about how an entirely novel unfulfilled customer need could be addressed (Jolly 1997). Others might have access to 'only' a novel technology but no specific vision of what it may be used for, no clue of the potential customer base, or how it will be even produced, sold, or distributed. The problem is indeterminate and these entrepreneurs are not searching to reduce ambiguity on the way to mastery as much as they are comfortable with seeking out additional sources of ambiguity. As entrepreneurs envision via imagination and theorizing new ways of using assets to produce goods (Foss and Klein 2012) via stargazing, new resource uses might be created. Yet entrepreneurship may also begin as a matter of treating the experimentation of capital assets as a kind of adventure without clear hypotheses (Simon 2001) – what we refer to as spelunking – in an attempt to discover new valued attributes on the way to idea generation. Those that are curious beyond their industry or functional discipline, engaging in spelunking or stargazing, are less likely to be caught off-guard by – and more likely to take advantage of – disruptive innovations when they arise. Adventuresome and bored search could also result from risk-aversity to unemployment, in the sense that people dabble in various knowledge areas that turn them into 'jacks-of-all-trades' and eventual entrepreneurs (Hsieh, Parker, and van Praag 2017, Lazear, 2004).

Our typology covers various types of curious search, and entrepreneurs could engage in different types basically simultaneously, via multi-tasking. For example, a bored nascent entrepreneur might concurrently engage in fiddling, haphazardly combining physical resources, and wool-gathering, by reading about a topic in general in search of inspiration. Despite the obvious potential for a dynamic model of curious search, our illustrations above suggest that all forms of curious search can occur at any stage in the entrepreneurial process, including within established organizations (Van Rensburg 2013). While an individual could conceivably use all six types during a short period of time, ambiguity-reducing and ambiguity-tolerant forms of curious search might suit different personalities or might emerge more naturally at different points in the venture creation process.

We also see our typology as valuable for identifying the dynamic, constantly changing mindsets underlying entrepreneurial action. Entrepreneurs may start off scanning an environment, yet we still do not know why they may switch from a focus on embracing additional ambiguity to a focus on reducing it. A typology such as ours can describe micro-level actions and practices that relate to those kinds of search transitions. For example, it is possible that fiddling and wool-gathering are more likely to occur as somebody considers their career options, thus representing a kind of pre-start-up stage which could itself lead to the discovery of serendipitous opportunities (Dew 2009). As bored search morphs into adventuresome search, we start to find ambiguity-tolerant adventurous forms (spelunking and stargazing) emerging in the early problem-formulation stages. Ambiguity-reducing forms (tweaking, rummaging, and sleuthing) could be dominant in the launch phase, when entrepreneurs are focused on figuring out their final products and customer segments. The entrepreneur's task, of course, is to stay aware of these behaviours while managing the potential conflicts arising as they emerge.

In the next section, we discuss the implications of our typology.

#### 4. Discussion

In theory, people balance the marginal benefits of search against the marginal costs (Morrison and Vancouver 2000; Stigler 1961), such that prospective entrepreneurs intentionally seek out or search for exploitable venture ideas (Shaver and Scott, 1992). Felin et al. (2014, 273) however point out that *'the [entrepreneur's] problem is not one where all (or even just some) solutions are somehow listed, listable, calculable, or comparable, but rather one of how we can account for the emergence of these solutions in the first place'*. They suggest that emergent novelty and heterogeneity are best captured by focusing more carefully on endogeneity (Felin et al. 2014). As Arikan et al. (2020) explain it, under conditions of Knightian uncertainty, people have no rational, profit-maximizing reason to begin any of the processes of forming an opportunity. It thus becomes important to address what might intrinsically motivate those very first bits of entrepreneurial behaviour, while also accounting for how ideas emerge from that action (Pittaway 2022). Such is the aim of our concept of curious search.

Some recent research has especially highlighted the paradoxical or hybrid styles of thinking where our typology especially applies. As Lerner et al. (2018, 53) remark, *'entrepreneurial action is birthed by a wide assortment [of] logics – ranging from deductive, causation-based reasoning, to heuristic and effectual reasoning, to disinhibition and a relative lack of ex ante reasoning altogether, to a shifting blend of all types'* (also see Hunt and Lerner 2018). At the same time, Pedersen (2018) remarks that *'those who'll succeed in this distraction-filled world as thinkers, managers, and innovators ... must be able to absorb diverse information from a wealth of sources, and they must be able to focus intensely'*. We contend that curious search is at the crux of mindsets that can handle both these distraction-oriented and focus-oriented extremes. Curiosity can motivate entrepreneurial search in a constantly changing, uncertain world, whether intended to solve a particular consumer or industrial problem, or indeed in the absence of any problem. We highlight how, at any given moment, curious search can be fuelled by either excitement for future possibilities (adventuresome search) or by the malaise of past apathy (bored search), in addition to problem-solving mastery-fostering search. The exploratory spirit of a curious mind can combine with imagination and cognitive capability leading to more frequent accessibility to creative thought and subsequent entrepreneurial ideation and action.<sup>7</sup> In all, we categorize and combine six types of curious search: tweaking and sleuthing (what we call 'clarifying' types of curious search), spelunking and stargazing ('adventuresome' types), and fiddling and wool-gathering ('bored' types).

Although curious search can be productive or unproductive, our work especially highlights how, even in the absence of extrinsic incentives or *a priori* knowledge about values in the solution space, curiosity stimulates exploratory behaviour, allowing people to seek out, resolve, and adapt to changes in their surroundings (Berlyne 1966; c.f. Rivkin and Siggelkow 2003).<sup>8</sup> Sometimes the mere uncovering and revelation of ideas and information is enough to motivate and generate

search. Curious search is at the midpoint of the spectrum between luck-based alertness and constrained systematic search (Fiet 2007). While related to experimentation, curious search is not wholly synonymous. Curiosity may be required to begin a process of curious experimentation, but curiosity also leads to other forms of search, such as reflective observations driven by an antecedent boredom and adventurously imaginative leaps that assist creative action in the present (Amabile 2011).

Overall, we position our typology of curious search as a toolset useful for practice (Nogueira et al. 2022; Sarasvathy 2021). As individuals engage in the different forms of curious search and learn to manage when those are used and how those are combined, they can begin to accumulate mastery of curiosity as an entrepreneurial competence. Our typology assists 'entrepreneurship as practice' theory by delineating the different forms of curiosity-driven behaviours so that they can be more explicitly targeted during practice, as well as through formal training and education (Thompson et al. 2022).

### **5.1. Connections to other conversations in the literature**

In Table 1 we summarize some areas of entrepreneurship research where concepts of curiosity and curious search can make important contributions; below we specifically address two. First, curious search is useful in adding nuance to theories of entrepreneurial temporality and process-based entrepreneurial action. Wood et al. (2021) describe how entrepreneurs may internalize narratives that revolve around initialization (i.e. the point in time for incipient action), pace (i.e. the time lapse between action and outcome) and chronology (i.e. the sequencing of action over time), when it comes to acting on their venture ideas. As Arikan et al. (2020) point out, in a world characterized by uncertainty, rationality alone is not enough to drive entrepreneurial action and perhaps curiosity is required to motivate it. We see wool-gathering and stargazing driving many early narrative processes; that is, stronger degrees of boredom or sense of adventure may stimulate nascent impatient entrepreneurs to adopt 'earlier initialization' or "faster pace" narratives. Furthermore, the sharing of narrative with others (what Wood et al. (2021) refer to as 'externalization' of narrative) may also stimulate pressure to engage in the experimentation forms of curious search, such as spelunking or fiddling.

We also see curious search naturally relating to recent entrepreneurship research on well-being, mindfulness, and meditation. Business leaders who practice 'walking meditation' frequently find a 'spot out in nature' (Levy 2000), prioritizing serenity over bustling contexts and opening the human imagination to innovative ideas and decisiveness, both in times of crisis and in the day-to-day grind (Miller 2000). We believe that such physically-active reflection, constantly renewing the environment via mobility and movement, can invite various modes of curious search. Search is not confined to the mind but rather constantly interacts with a wide range of bodily and social activities (Modell 2003) that are critical for sparking perceptions, thoughts, and images in processes of novelty creation (Cornelissen 2013).

### **5.2. Connections to imagination**

Our typology of curious search can speak to a couple conceptualizations of entrepreneurial imagination. In their multi-element model of entrepreneurial imagining, Elias et al. (2022) address 'experiencing', 'early creating', 'reaching an impasse and gestating', 're-creating and evaluating imagined futures', and 'choosing and enterprising'. All of these stages could be motivated by extrinsic incentives, while our notion of curious search is explicitly and exclusively based on intrinsic motivation. Consider Kier and McMullen's (2018, 2285) description of imagination as 'unconscious, embodied, and sensory'; our notion of curious search need not point to unconsciousness. However, it does still relate to Kier and McMullen's (2018, 2020) concepts of creative imaginativeness, social imaginativeness, and practical imaginativeness, in the sense that curiosity could drive the novel connections

**Table 1.** Relating curiosity and curious search to a variety of other entrepreneurship research topics.

<i>Attention</i>	The entrepreneur is handicapped by limitations in his attentional resources (see Gifford 1998). Continuously planned search driven by deliberate calculation of long-run maximization, especially in complex environments, can dilute an entrepreneur's energy and time due to information overload. As Wojtowicz and Loewenstein (2020, 137) remark, "the process of deliberately deciding how to direct attention itself requires attention". Curiosity can help direct attention in an economizing way that does not itself require the expenditure of attention (Wojtowicz and Loewenstein 2020).
<i>Creativity</i>	Insofar that the creative process is intended to create something novel (or at least unfamiliar), curiosity precedes it. Yet very little work has attempted to clarify the linkages between the two (see Chang and Shih 2019). Whitehead (1967) was a first to propose curiosity as the driver of creativity. As described by Schutte and Malouff (2020, 941) "curiosity may be an impetus for creativity in that it can lead to information gathering . . ."
<i>Intuition</i>	One possible framework would place intuition as feeding into curiosity (see Simon 2001); that is, unfamiliar and unorganized information is processed in a synthetic and holistic manner that generates cues and signals for intuitive individuals (Olson 1985; Kickul et al. 2009), which generates desire and curiosity for new information that can resolve knowledge gaps or help one to experience the unknown.
<i>Knighitian Uncertainty</i>	The kind of curious search most useful for the entrepreneur also changes. Marginal changes to a landscape only require additional clarifying search, where agents are curiously searching to fill the gaps in knowledge required to solve the problem at hand. But when radically novel situations arise, and clarifying search becomes less useful, entrepreneurs are best prepared if they have predispositions to engage in adventuresome search. While these behaviours may be addressable via the notion of 'exploration', focal in organizational studies, here the focus is on curiosity as a human competency or capacity, at the individual level, that fuels entrepreneurial search.
<i>Perspective-taking and empathy</i>	People with higher trait curiosity have been found to be more likely to consider another's perspective and the meaning behind their emotion (Main et al. 2017). This process inhibits destructive behaviour and promotes empathetic or prosocial behaviours during interpersonal conflict (Gino 2018; Halpern 2007). The relationship between intellectual curiosity and empathy can be reflected in curious search across people's mindsets, opening the door for entrepreneurial identification of customer needs and wants.
<i>Play/serendipity</i>	Curious search—especially adventuresome and bored search—requires making an effort behind merely grasping what is in front of one's eyes. Whereas both serendipity and alertness are only meaningful terms verified by outcomes ex post, and serendipity emerges suddenly exactly where luck ends and cognition begins, curiosity and curious search describe unfolding behaviour at the intersection of cognition and affect ex ante.
<i>Proactiveness and openness to experience</i>	Whereas curiosity presumes ambiguity and uncertainty, proactiveness need not involve that uncertainty at all. Also consider openness to experience, which has been positively correlated with all curiosity measures (e.g. I-type and D-type) (Hunter et al. 2016).
<i>Risk-taking</i>	In recent research, Lauriola et al. (2015) find that individuals scoring highly on I-type curiosity were more likely correlated to risk-taking behaviour and carefree attitudes towards learning, yet those scoring highly on D-type curiosity correlated more with thoughtfulness and caution.
<i>Self-challenge</i>	As reviewed by Kashdan et al. (2004), a quadratic relationship between curiosity and challenge has been replicated in diverse settings. Loewenstein et al. (1992) found that curiosity increased as individuals obtained more information and success towards task completion, but there was a point of diminishing returns in curiosity and task persistence.
<i>Teams and firms</i>	Zahra (2008, 246) notes that informal (corporate) entrepreneurial activities often "complement formal initiatives and sometimes broaden organizational search for opportunities by venturing beyond the officially sanctioned organizational domain". In that informal manner, curiosity may be exploited to help organizations better manage market uncertainty and volatility.

required for inventive thinking, the perspective-taking typical of empathy, and mental simulation required in planning and project management.<sup>9</sup>

While imagination is not necessary during prolonged experimentation-based curious search, it can be useful. As described by Chiles et al. (2013), the human action that flows from expectations of an *imagined future* (Shackle 1974) has been described as 'experimenting' (Shackle 1972, 271) and 'groping' (Shackle 1972, 271). But imagination fundamentally enhances prolonged theorization-based curious search (e.g. via 'speculation': Lachmann 1986, 135). Although theorization itself is what superficially juxtaposes ideas and concepts with only

logic to form explicit knowledge, imagination will often represent the tacit knowledge important to generate the hypothetical outcomes and valuation in the mind's eye. The imagination used to *evaluate* a juxtaposition during curious search, can be followed by additional search that introduces more fine-grained details, requiring still more additional bits of imaginative evaluation. In other words, we see curious search and imagination (including mental simulations: see Gaglio 2004) driving each other, in a process that may require vacillating between consciousness and sub-consciousness. Curious search opens the door for the kind of sub-conscious imagination at the heart of the 'ability to learn without deliberate search' (Kirzner, 1983, 148).

### 5.3. Future research

We suggest that search does not automatically result from entrepreneurial attitudes such as self-efficacy, confidence, or commitment (e.g. Trevelyan 2009); instead, curiosity is more critical, and emerges in various stages across the entrepreneurial journey. Our typology offers the potential to consider the effectiveness of different kinds of curiosity-driven behaviour within the entrepreneurial process, as well as the skills or conditions that support effectiveness of those search modes (Kashdan, Fincham, and Linley 2004). For example, Ucbasaran et al. (2008) found that entrepreneurs report higher levels of information search intensity and those who utilized more information sources were significantly more likely to identify more opportunities. Future research could explore which types of curious search were used by these entrepreneurs and explore whether differential usage of curious search modes related to entrepreneurs' experience levels and levels of confidence (Cooper, Folta, and Woo 1995). Zahra (2008) illustrated that '*informal search that unfolds through autonomous entrepreneurial activities is likely to result in diverse opportunities that vary in their relatedness to a company's technology base, time horizons, and skills needed for successful exploitation and potential payoff*' and we propose that different forms of curious search may drive this variance.

Our typology of curious search offers a parsimonious system framework linking imagined worlds with the real world. For example, research could address the nature of the conditions underlying transitions between the use of one form of curious search versus another. What leads entrepreneurs to switch from ambiguity-reducing curiosity (i.e. clarifying search) to ambiguity-tolerant curiosity (i.e. adventuresome or bored search)? Why would people stop stargazing and start spelunking? When might spelunking shift to sleuthing? Overall, we believe that there are conditions that moderate the interaction between experimental forms of curious search and the use of imagination.

Many additional questions arise regarding how entrepreneurs should cope with their own curiosity and what 'rules of thumb' they might adopt regarding curious search efforts. For example, although curiosity can emerge from the useful signal of boredom, it may also serve to distract (e.g. Isikman et al. 2016) or fuel damaging procrastination. Also, entrepreneurial teams may not know how to focus or leverage their curiosity, thereby reducing their decision-making ability and the effectiveness of team dynamics. Within a team, how does the entrepreneurial leader coordinate curious search and when should it be reduced or shut off?

In characterizing curiosity as a competency that one can acquire through learning, experience, and practice (Harrison, Sluss, and Ashforth 2011; Loewenstein 1994), we suggest that it informs entrepreneurship education efforts. Curiosity should be included in competency frameworks for entrepreneurship education alongside other competencies. Students can be taught to appreciate the informational value of merely uncovering the unknown, in their everyday lives, just as much as they are taught about the informational value of lessons learned from failure. It is valuable for students to distinguish and to become aware of switching between adventuresome forms of curious search versus its clarifying and bored forms, coordinating the three very different manifestations of curiosity that can characterize entrepreneurship.



## 6. Conclusion

Under conditions of Knightian uncertainty, people have no rational, profit-maximizing reason to begin any of the processes of forming an opportunity (Arikan, Arikan, and Koparan 2020). As the Brian Chesky and Joe Gebbia example with AirBnB helped to illustrate, curiosity and curious search play important roles in the entrepreneurial journey. We have cast a wide net to capture stories and messages shared by entrepreneurs in order to generate a broader understanding of what we call 'curious search'. Our study has infused core dimensions or characteristics of curiosity into modes of recombinant search, thus developing a 3 × 2 typology of 'curious search', which includes what we call clarifying search, adventuresome search, and bored search. We describe those six types of curious search and how they might be useful in understanding entrepreneurship practice. Curiosity and curious search can be applied to a variety of research topics. Future research should consider when and how curious search generates additional diversity in entrepreneurial opportunity; how entrepreneurs and entrepreneurial firms can best contextualize and time the different modes of curious search; how entrepreneurial teams can manage curiosity and curious search in inspiring, yet effective ways; and the extent to which curiosity affects the latter stages of the entrepreneurship process.

## Notes

1. Our typology expands but also contrasts with work from other researchers working in this kind of topic. Jeraj and Antoncic (2013) develop a construct of 'entrepreneurial curiosity' and show that it can be an independent construct dimension in relation to other types of curiosity. While their empirically-driven conceptualization of 'entrepreneurial curiosity' definitively includes 'flow' and mere 'interest', we don't believe that the earliest stages of entrepreneurship – when entrepreneurial curiosity is arguably most salient – need require either of those. More recently, Arikan et al. (2020) separately suggest that an 'entrepreneurial curiosity' explains why entrepreneurs begin the process of forming an opportunity under conditions of Knightian uncertainty. We believe that we are expanding on both those pieces of research. Probably most notably, our framework for curious search welcomes perceptual or sensory curiosity as much as epistemic curiosity (cf. Arikan, Arikan, and Koparan 2020).
2. This notion is described well by Foss and Foss (2008, 193), who remark that '*entrepreneurs may only be able to identify some elements of an opportunity, so they need to invoke imagination and search for and process information in order to more fully identify and evaluate the opportunity*'.
3. Ahuja and Morris Lampert's (2001) framework would be an excellent starting point for examining the organizational management of curiosity.
4. We do also wish to stress a distinction between curiosity and 'activity for activity's sake'. The former involves a genuine desire to learn, explore, or understand something new, thus driven by a thirst for knowledge. On the other hand, the latter entails engaging in tasks or actions, driven merely by a need to appear busy or to conform to societal expectations.
5. Such hypotheses, according to our notion of curious search, are not at all necessarily associated with *a priori* estimates of utility or fitness.
6. Our concept of 'sleuthing' is not unlike Weinberger et al.'s (2018) use of the term 'pondering'. We prefer the term 'sleuthing' simply because it more strongly connotes an aim of solving a (mysterious) problem.
7. The notion of curiosity figures in well with a radical subjectivist approach to entrepreneurship, where entrepreneurs perpetually generate novelty by combining and continually recombining capital resources over potentially wide timeframes, via nonoptimal choices based on limited knowledge, imperfect foresight, and arational, unstable expectations (see T. H. Chiles et al. 2010 for a wonderful review of such radical Austrian approach).
8. In describing the virtuous cycle of discovery and creation of entrepreneurial opportunities, Zahra (2008, 244) does explicitly suggest that corporate entrepreneurs may be 'driven by curiosity'.
9. Whereas McMullen and Kier (2017) and Kier and McMullen (2018, 2020) treat imagination as an ability, Elias and colleagues treat imagination more as a process or its associated instantiations. We do not see major conflicts in these two different systems of terminology, given that a variety of other terms are also often used to refer to both ability and process (e.g. 'communication', 'problem-solving'). The context can eventually determine how the word should be interpreted. We see our concept of 'curious search' fitting well with both usages.

## Acknowledgments

We are grateful to our reviewers for their thoughtful and constructive feedback. We also thank William B. Gartner, Dan Hsu, Jackson Nickerson, and Todd Zenger for their valuable and encouraging comments during prior drafts.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

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