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## Serendipity: obstacles and facilitators

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### ABSTRACT

*Serendipity is a term used to describe the occurrence of a fortunate discovery originating by chance. Because of this, the term is often associated with the creative process or scientific discovery. Fortuity and randomness, factors often considered intertwined in research and scientific experiments, play an important role in the phenomenon of serendipity. In the study of creativity, such a phenomenon can impact discoveries, inventions, and innovations. Famous examples include that of penicillin, discovered by Alexander Fleming, and the "invention" of Velcro, by George de Mestral. Serendipitous phenomena are said to contain a fortuitous, "inexplicable" element within the framework of formal logic. Although its importance for creativity is recognized, serendipity can be hampered by the contemporary tendency to standardize answers in online searches, and by the enchantment of algorithms, among other obstacles. The era of ready-made answers suggests patterns, models, and formulas for the resolution of problems which seek to "eliminate" chance and fortuitousness. Serendipity is often connoted as mysterious, miraculous, and inexplicable, "the presence of the right person in the right place", sometimes even attributed to the encounter between divine creation and human creativity. The present study addresses serendipity through the discussion of the concept, exemplified by widely known cases, and points out the potential contemporary obstacles to the occurrence of the phenomenon. It is possible to say that, in a contemporary scenario, it is important to be on alert for the potential traps presented by the enchantment of algorithms and ready-made answers, as they can misguide researchers opening-up to potential new avenues of discoveries. Although the era of ready-made answers brings about difficulties to potential serendipity discoveries, it is also an opportunity to be open to unexpected and unanticipated findings.*

**KEY WORDS:** serendipity; creativity; discoveries; Science.

## Introduction

Ross (2022) defines serendipity as a “fortuitous accident; the exploitation of luck by a prepared mind”. He discusses the part played by luck, “this magic ingredient, as beyond human control, which resists theorization as well as empirical investigation”, pointing out to an intersection between accident and the sagacity of the researcher, thus, emphasizing the role of individuality and environment working together to produce and recognize serendipitous phenomena. In his words “Luck is useless without right person at right time” (Ross, 2022, p. 1482).

Important to detach, in his definition, the expression of a “prepared mind”, and analyze what it means in a contemporary scenario of ready-made answers, constant pressure for rapidity solutions, and “enchantment of algorithms”, as stated by Finn (2017). This will be the main objective of this paper: to develop a deeper understanding of serendipity as a process, and analyze what aspects can favor or hinder its occurrence.

The article begins with its definition, its relationship with creativity and innovation, and connections with other concepts, particularly that of bisociation and abduction. It then presents the types of serendipities and case studies which illustrate each one, and discusses serendipitous encounters in the contemporary scenario of ready-made answers, algorithms enchantment, and impoverishment of cognitive processes in daily life.

Investigations around information search, recommendation systems, science history, and empirical research on serendipity will serve as raw material for constructing the article.

## Material and Methods

The present study adopts a theoretical-conceptual methodology, addressing serendipity through the discussion of its concept, exemplified by widely known cases, pointing to the potential contemporary obstacles to the occurrence of the phenomenon.

### Concepts

Serendipity refers to the occurrence of a fortunate discovery originating in chance. For Bloch et al. (2020, p. 1597), it can be defined as “the act of finding answers to questions not yet posed”.

Another way of seeing the phenomenon is: “Serendipity means accidentally discovering something valuable” (E Cunha; Clegg; & Mendonça, 2010, p. 319), implying a metaphorical association, that is, seeing something as other.

Gestalt theory is helpful in understanding this change of perspective, being similar to the ground-figure concept, in which the same image can be seen as “figure or ground”, depending on the context in which the object is inserted.

According to Pham et al. (2023), serendipity allows individuals to generate novel and meaningful solution variants by actively searching for accidental contiguities of distant elements, referred to as bisociation. Moreover, in their studies, they have discovered that, through serendipity, some workshop participants found unforeseen associations within the ill-defined problem.

### The origin of the term: the 3 Princes of Serendip (Sri Lanka)

Horace Walpole, 18th century writer, coined the term serendipity in his report of the three Princes of Serendip, an old Persian tale. Describing how the Princes walked through the word and made non-intentional and fortunated discoveries, he denominated those as “serendipitous”. Although Walpole’s term shows up in literature, Ross (2022, p. 1481) observes: “While Walpole coined the word, he

obviously did not invent the concept”.

In a letter to a friend dated from January 28, 1754, Walpole mentions that the Princesses had a “special kind of luck”, resulting from a combination between an accident and the sagacity (or perspicacity) to understand it (E Cunha et al., 2010).

## Serendipity and creativity

Serendipity is generally studied in close relationship with creativity (Dos Santos, 2016, p. 27), revealing some of the most important cognitive processes for its flourishing, as in the discovery of penicillin, mentioned below.

In Boden’s words: creativity is the capacity of advancing with new, surprising ideas or objects. Ideas, for the author, include concepts, poems, musical compositions, scientific theories, cooking recipes, choreographies, jokes; while objects include paintings, sculptures, machines, vacuum cleaners, ceramics, origamis, etc. (Boden, 2004, p. 1).

Those ideas or objects, when realized in a fortuitous way, are considered serendipitous discoveries.

### Cognitive processes: abduction and bisociation

A mind capable of embracing fortunate discovery originating in chance is open to the new and flexible enough to deal with pseudo-impossibilities (Piaget, 1986). With this framework for understanding the need for mental flexibility for both creativity and serendipity, two important cognitive processes are presented: abduction and bisociation.

Fortes (2020, p.2) defines abduction as a “logical operation of explanatory reasoning out of a specific set of premises, both discoveries and hypothesis formulation”. Compared with deduction – drawing a true conclusion from valid premises – and induction – inferring a probable conclusion from available information – abduction “seems to be a tendency of the human mind to deal with puzzlement”.

Generating a hypothesis given a context of insufficient information or uncertainty, abduction processes is related to “the natural capacity for generating possible explanations”, as a creative and innovative reaction to surprise and puzzlement. Thus, this abductive process of inference encompasses words such as surprise, puzzle, curiosity, guessing, or discovery.

It is well-known that “new knowledge depends upon processes often uncontrolled by a rational mind”. In science, it is common to see researchers trying to explain surprising or anomalous phenomenon, searching for reasons for it to be true. Knowledge construction depends largely on the observer’s active role in “coordinating previous knowledge, observed strangeness [...], and a plausible momentary truth [...]” (Fortes, 2020, p. 3).

In short, abduction is the process of creating new knowledge based on feeling and intuition, “a reaction to surprise that enables the formation of the possible, as in Piaget (1986), a step toward amplifying what is known through concluding something useful or new” (Fortes, 2020, p. 5).

The relationship between serendipity and abduction is better understood in Meneses’s statement: “The scientific process engages human capacities beyond mere logic and rationality, encompassing our abilities for imagination, creativity, an innovative thinking” (Bazi et al., 2020; Bezuidenhout et al., 2018, in Meneses, 2023, p. 1061).

In turn, the term bisociation Koestler (1964) explains originality

instead of habitual thought, stating that habit is a set of associations within one single matrix, while creativity originates through the bisociation of independent matrixes. Bisociation goes beyond mere association, putting in contact thoughts and ideas which can be far away from one another while allowing new synthesis, thus explaining its relationship with serendipity.

A good example of bisociation is the invention of the helicopter, inspired by dragonfly’s aerodynamics. Two separate matrixes: the dragonfly, belonging to the insect’s realm, and the helicopter, to flying engineering. While observing the dragonfly, the idea of constructing a helicopter appeared.

In Koestler’s model of creativity (1964), bisociative thinking occurs when a problem, idea, event or situation is perceived simultaneously in two or more “matrices of thought” or domains.

The pattern underlying [the creative act] is the perceiving of a situation or idea in two self-consistent but habitually incompatible frames of reference.

Says Koestler (1964, p. 35):

“I have coined the term ‘bisociation’ in order to make a distinction between the routine skills of thinking on a single ‘plane,’ as it were, and the creative act, which ... always operates on more than one plane. The former can be called single-minded, the latter double-minded, transitory state of unstable equilibrium where the balance of both emotion and thought is disturbed”.

Both cognitive processes – bisociation and abduction - are helpful in understanding serendipitous encounters. Serendipity remains linked to the unexpected, indicating that eventually, the answer to a problem or information searching could depend on distinct matrixes, requiring individuals to generate hypothesis in absence of defined parameters, as in abductive thought.

Three well-known cases are presented and related to Yaqub’s proposed taxonomy of serendipity: Alexander Fleming with the first antibiotic, George de Mestral with Velcro, and Viagra, which resulted from Pfizer’s pharmaceutical research.

In 1928, Dr. Alexander Fleming returned from a holiday to find mold growing on a Petri dish of Staphylococcus bacteria. He noticed the mold seemed to be preventing the bacteria around it from growing. He soon identified that the mold produced a self-defense chemical that could kill bacteria.

The VELCRO®<sup>1</sup> brand of hook and loop was invented by a man named George de Mestral in the 1940’s while hunting in the Jura mountains in Switzerland. Mr. de Mestral, a Swiss engineer, realized that the tiny hooks of the cockle-burs were stuck on his pants and in his dog’s fur, and wondered how they attached themselves.

In the third case, VIAGRA, the Pfizer researchers who discovered it weren’t even looking for it. Sildenafil, the active ingredient in Viagra, was originally developed to treat cardiovascular problems and later discovered to have side effects.

All three cases have two elements in common: non-planned actions and non-anticipated results.

The case of Columbus discovering America when searching for a new trade route to the Orient, and Fleming, who discovered penicillin because of his research on influenza, as well as the other cases mentioned, are only some examples of serendipity. A taxonomy of serendipitous experiences is proposed by Yaqub [12]

<sup>1</sup> VELCRO = Velours (VELVET) + crochet (HOOK).

and commented bellow.

## Types of serendipity

“History of science is replete with instances where deviations from the expected trajectory have resulted in transformative scientific knowledge” (Meneses, 2023, p. 1062).

Yaqub (2018) characterizes different variations of serendipity, defining four types, based on the motivation and outcomes, as in Figure 1.

**Figure 1 Four types together with four mechanisms of serendipity (Yaqub, 2018, p. 172)**

		What type of solution did the discovery lead to?	
		Solution of the given problem	Solution of a different problem
Is there a targeted line of enquiry?	Yes: Searching with a defined problem in mind	Mertonian serendipity	Walpolian serendipity
	No: Searching with no particular problem in mind	Bushian serendipity	Stephanian serendipity

The Walpolian type of serendipity refers to a targeted search solving unexpected problems; Mertonian type is similar to the first one, but relates to expected problems via unexpected routes. Bushian serendipity, in turn, refers to untargeted searching solving immediate problems while on the Stephanian type, the problems will appear later, not immediately.

An example of the first type is Buchner’s discovery that mustard gas could treat cancers caused by over-expression of white blood cells, giving birth to modern chemotherapy (Yaqub, 2018, p. 170).

Mertonian type is exemplified by vulcanization’s discovery, by Goodyear. While searching for more than a decade for a way to make rubber thermostable, Goodyear accidentally allowed a mixture of Sulphur and rubber to touch a hot stove, thus discovering one of the most important materials for the automobile industry.

An example of third type is saccharine, an artificial sweetener discovered by Fahlberg, who noticed a sweet taste on his hands while at his lab.

Stephanian discovery, on the other hand, “serves to pique one’s curiosity, even though it does not directly solve an immediate problem, holding interest until it solves a later problem” (Yaqub, 2018, p. 171). The example is the safety glass discovery, as explained below:

“In 1903, Benedictus dropped a flask. The flask shattered but he noticed to his surprise that the fragments of glass did not fly apart, the flask remained almost in its original shape. He found that it had a film on the inside to which the broken pieces of glass had adhered. He realized that this film had come from the evaporation of a solution of collodion (cellulose nitrate, prepared from cotton and nitric acid) which the flask had contained. After the incident, Benedictus learned of automobile accidents, with serious consequences from flying glass. This was the problem for which his solution was waiting, and his nonshattering flask became safety glass” (Yaqub, 2018, p. 171).

Among the four types, in contemporary scenario, the Walpolian type can be seen as the most commonly found in scientific discoveries, while the Stephanian one is the least common, due to the quest of control posed by scientific protocols. Therefore, it is important to understand the role of control in relation to serendipity.

## The quest of control

More important than classifying the types of serendipity is understanding the paradox of control (McBirmie, 2008). The author investigates serendipity, with its “seemingly random, elusive and unpredictable nature” (p. 600) in information seeking, asking if “control may direct or indirectly have a role in serendipity” (p. 604), suggesting that, analog to jazz improvisation, serendipity is both passive and active, being both predictable and unpredictable.

McBirmie (2008, p. 607) describes an experiment in which “the research participants associated the term serendipity with chance, discovery and process, echoing Walpole’s definition”. The subjects “linked regularity, but not rarity, to how often the information seeking or improvising activity took place”, stating that “although participants maintained awareness, even expectations, of serendipity, none of [them] extended this awareness to reliance”. Recognition was not immediate, suggesting “the idea of a flash, instance, or moment of serendipity, tying in with a recent description of information use, [that is], the precise moment when the human information environment and human come together” (Spink et al., 2006, p. 140, in McBirmie, 2008, p. 607).

When discussing control versus chance, McBirmie states that “the perception aspect of serendipity is subject to some degree of control” (McBirmie, 2008, p. 611), explaining that “although one cannot control the process of serendipity, one may be able to control one’s perception of the result of the process”, concluding “information seekers need the ability to find required information efficiently, but care must be taken not to ignore the benefits of chance discoveries, or worse, to threat unintended outcomes automatically as wrong results” (McBirmie, 2008, p. 612).

Moreover, information seeking is subject to recommender systems, that is, “software tools that suggest items of interest to users” (Kotkov et al., 2023, p. 383). The authors point out the quest of the possibility of designing recommendations to be serendipitous, that is, a “complex combination of relevance, novelty and unexpectedness”. The warning is about overspecialization, “when a user cannot discover new kinds of items as the recommender systems only suggest items similar to what the user usually consumes” (Kotkov et al., 2023, p. 386)

The authors further state that serendipitous recommendations enhance novel insights when “a user acquires useful information while interacting with a node of information for which there were no explicit or a priori intentions” (Kotkov et al., 2023, p. 386).

Both in information seeking and science history, deviations from the expected trajectory are not always well perceived, - even while they may lead to possible positive outcomes - due to the paradox of control, mentioned above.

Thus, the next section is dedicated to discussing what can favor or hinder the serendipity phenomenon in a contemporary scenario.

### Serendipitous encounters: obstacles and facilitators of serendipity

“Openness and mental readiness, marking a willingness to experience novelty and the researcher’s knowledge and experience”, according to Meneses (2023, p. 1064), can favor serendipity. The author analyses Becquerel, Fleming and Spencer’s discoveries, all with unique intertwining of the scientific method and bissociation, illuminating serendipity’s pivotal role in scientific knowledge’s evolution (Meneses, 2023, p. 1071).

“Common patterns are observable across these cases. Each

discovery emerged from an unexpected occurrence during a methodical scientific inquiry, highlighting the critical interplay between chance and systematic investigation. Bissociation, or the cognitive process of associating previously disconnected concepts, was fundamental in all three instances, underscoring its potential as a catalyst for scientific breakthroughs” (Meneses, 2023, p. 1071).

Important to detach, in the author’s words, that in Becquerel’s discovery of radioactivity, the “initial hypothesis was contradicted by his experimental observations”. “Instead of leading him astray, these inconsistencies pushed him to refine his experimental methodology and continue his investigations, eventually leading to the discovery of radioactivity” (Meneses, 2023, p. 1071). Quoting Yaqub, Meneses understands that, in this case, “the contradiction of a theory, instead of being a setback, serves as a launching pad for serendipity”.

Bloch et al. (2020, p 1606) understand that

“Moments of discovery constitute key transition points in the research processes behind advances. A number of other events (turning points), both internal and external, may influence the research process and decision making by the researcher. The first is set-backs. Many, though clearly not all, of the advances are also the results of persistence in the face of negative results, particularly failed research experiments, but also paper rejections and skepticism concerning results. For these, persistence and drive to achieve advances despite set-backs is a key ingredient in many of these advances. However, there are also cases where the process was very rapid and without any major hitches, following a random event that facilitated the discovery”.

In the conclusion of a study of 12 highly cited papers, the authors found that there is more to be investigated than “just the beginning and ending points” of the studies. Various elements go beyond and appear to influence serendipitous discoveries, such as “early career researchers [who] tend to be more innovative” and, thus open-minded for serendipity derived to unplanned factors during a scientific research.

### The society of urgency, the ready-made answers era and the impoverishment of daily cognitive processes

As technology moves forward through the 20<sup>th</sup> century, a new phenomenon takes place: the impoverishment of cognitive processes in daily life. While developed to facilitate day-to-day tasks, it also brought about the impoverishment of cognitive reasoning and thoughts, now delegated mostly to machines.

This phenomenon appears in a more prevalent way in the fields of great artificial intelligence advances due to the fact that it tends to transfer basic mental operations to machines, leaving the human user with a simplified mental process, potentially impoverished.

The development of apps using artificial intelligence grows side by side with minimum mental work by users. As such, technology can auto-predict words and text while they are being written; calculations are solved almost instantaneously with a simple access to a machine, etc.

There is also a change in time patterns when mediated by technologies (Malvezzi, 1999). In the culture of urgency, “immediate effects are expected in all kinds of investments, projects and actions. (Bendassolli et al., 2010).

“To gain time, individuals perform, simultaneously, study, work, family and social activities, in spaces and periods traditionally dedicated to other issues. Nowadays, just a few persons do not

dedicate some of their weekend hours to complete some work” (Bendassolli at al., 2010, p. 3). Digital and organic life are mingled and, sometimes, interchangeable.

It is well-known that the impacts of the “society of urgency” (Bendassolli at al., 2010) are related to reasoning problems. Likewise, decision-making, while taken in hyper-inflated information environments, may result in various kinds of cognitive biases (Kahneman, 2011; Tversky & Kahneman, 1974; Ariely, 2008; Thaler, 2017).

The impoverishment of daily cognitive processes comes with a deification of technology, the “idolatry of TECHNE”, in that society becomes more and more dependent on apps and algorithms, valuing startups and ready-made answers over reasoning and contemplation (Arendt, 2018).

According to Oliveira (2008, p.3), the “technique, the TECHNE and the technology “correspond to three phases of the history of technical development. “The technique is as old as human being, same as wisdom. It begins with instrument’s fabrication”. In turn, TECHNE comes up at Ancient Greece, parallel to philosophy, [being] another kind of knowledge, different from technique in a general sense, not limited to pure contemplation of reality, but associated with practical problem solving, searching for guiding people in their fight for improving and perfect surviving, cure of diseases, building instruments, houses, and so on Oliveira, 2008, p. 4). Technology, broadly understood, is “a set of knowledge and organized information, derived from diverse sources such as scientific discoveries and inventions, obtained through different methods, used to produce goods and services” (Correia, p.250, in Oliveira, 2008, p. 6).

Contemporaneity is marked by technologies. Mythicized and deified, their instruments and techniques, especially media ones, can impact cognitive processes, compromising human reasoning.

Studying these contemporary phenomena and investigating how the deification of technology can lead to the impoverishment of daily cognitive processes is crucial to understanding their consequences to the serendipitous experience.

## Obstacles to creativity and serendipity

“Due to our knowledge of a certain theme, we feel a little difficult to find new and relevant information when researching, [we feel] that results presented only reiterate, not adding at what we still know, [that is,] it is difficult to really discover something new” (Dos Santos, 2016, p. 30).

The author tested ways of introducing randomness in the creative process by varying time and materials, defying previous conditionings and inserting odd objects in order to understand the obstacles mentioned above (Dos Santos, 2016, p 36).

According to him:

“Those activities were designed to understand how to enhance the occurrence of serendipity by introducing randomness in a process, with notorious and beneficous results. This study was made in the context of creative process, once in it that there is a need of obtaining new and, most of the times, poorly defined, information, that is, when the individual don’t know for sure what he (or she) is looking for, as an inspirational source, and, thus, it is evident the crucial importance of serendipitous events” (Dos Santos, 2016, p 50).

According to (Dos Santos, 2016, p. 46), ambiguities in a process can

be seen as sources of new discoveries due to the possible different interpretations of the same information.

Those elements have direct impact in the serendipity phenomena, seeing as the ready-made answers - or algorithms that lead to them - can hold back the search for unforeseen answers, with the individual disregarding fortuitous and unpredictable aspects during his or her search, be that academic, scientific simple intellectual curiosity.

To note, the Bushian and Stephanaian types of serendipity would likely be the most affected in this scenario, as they represent a type of search with no particular query in mind.

## Enchantment of algorithms

Finn (2017) develops a comprehensive study on algorithms, “this figure of a quasi-mystical structure of implemented knowledge, [...], both pervasive and poorly understood (Finn, 2017, p. 6). As the vehicle or tool of computation, [it is] the object at the intersection of computational space, cultural systems, and human cognition.

The author defines it “[as] a recipe, an instruction set, a sequence of tasks to achieve a particular calculation or result, like the steps needed to calculate a square root or tabulate the Fibonacci sequence”. With the origin of the word arising from the ninth century, “algorithm” came to describe any set of mathematical instructions for manipulating data or reasoning through a problem”.

Important to detach, in the words of the author,

Throughout this evolution, the algorithm retained an essential feature that will soon become central to the story: **it just works**. That is to say, an algorithm reliably delivers an expected result within a finite amount of time (except, perhaps, for those edge cases that fascinate mathematicians and annoy engineers) (Finn, 2017, p.17).

The fact that algorithms work, as emphasized, is the key point to understand its impact in the serendipitous experience. In the middle of an experiment, one can be satisfied with this ready-made answer and give up deeper searching, from whatever the start point would have been.

It is the ideology that underwrites the age of the algorithm, and its seductive claims about the status of human knowledge and complex systems in general form the central tension in the relationship between culture and culture machines (Finn, 2017, p 26).

Enchantment, seduction, deification: three possible names for characteristics of relationship between humans and machines, representing obstacles to serendipity and the creative processes, in general.

Importantly, as algorithms represent repeatable, practical solutions to problems, they can, eventually, block creativity. Another aspect to be considered is that a unique answer can be also the opposite of creativity.

Algorithms solve previously identified problems, bringing up more complexity to the occurrence of serendipity, eventually representing traps that can misguide researchers in opening-up to potential new avenues of discoveries.

All these elements lead to the question: With the enchantment of algorithms, what’s left for creativity?

Finn continues questioning the common statement: Everything is on Google!

In a pragmatic, instrumental reason’s ideology, Google describes

algorithms as “the computer processes and formulas that take your questions and turn them into answers” (Finn, 2017, p. 18).

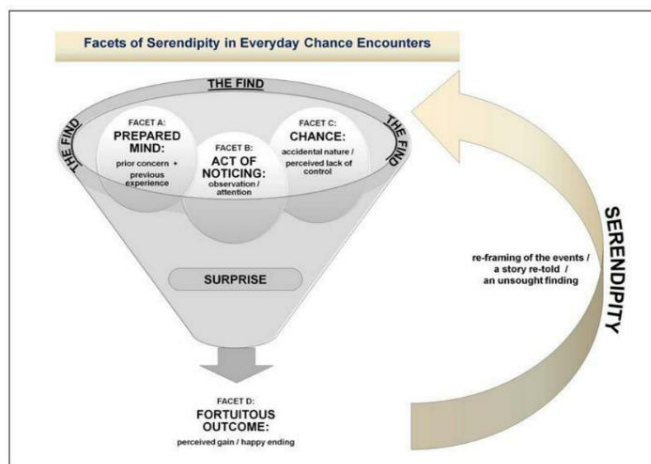
According to Finn, Google exemplifies a company, indeed an entire worldview, built on an algorithm, PageRank (Finn, 2017, p. 20).

In his book, Finn comments what Siva Vaidyanathan has called the Googletization of Everything (Finn, 2017, p. 68), reinforcing the idea of impoverishment of cognitive processes and obstacles to creativity and serendipitous experiences.

## Favoring serendipity

Despite the obstacles in the contemporary scenario, many factors can favor serendipity. In Figure 2, a model of serendipitous experiences in daily life is presented.

**Figure 2: Facets of serendipity in everyday chance encounters** (Rubin et al., 2011, p. 24)



Observing the facets pointed by the authors, it is possible to say that both a prepared mind and the act of noticing (anomalies, for instance) are under control of the individual and, can also be trained. The facet of chance is the one, in Ross’s words, understood as a “magic ingredient, as beyond human control, which resists theorization as well as empirical investigation” (Ross, 2022).

Thus, if one asks if it is possible to educate for serendipity, many answers can be given, but it is possible to say that it depends on the kind of education.

An education non-instrumental is about enlarging horizons. It is not about giving children ready-made answers as information. Educating for serendipity means offering opportunities to be open to unexpected and unanticipated findings.

Nevertheless, the mystic Sadhguru (n. d.) adds that “unfortunately, today’s education has slowly shifted into a mode where people believe it is about enforcing information”.

## Final considerations

We cannot, therefore, predict when we are faced with a potential case of serendipity, but we must always maintain our capacity for acute observation and our curious, inquisitive and critical spirit in the face of phenomena that appear to be in front of us, even when they appear to be erroneous (McCay-Peet, & Toms, 2015).

Due to the close relationship between serendipity and creativity, the ossification of dominant mindsets could be considered obstacle number one for the emergence of the serendipity phenomenon. A prepared mind, on the other hand, contributes to serendipitous encounters, as “serendipity is a relational concept emerging from the

interactions of people and possibilities”. As says Ross, “serendipity is perhaps best conceived as enacted luck” (Ross, 2022, p. 1487).

As applied to scientific and academic work, it is possible to quote McCay-Peet, & Toms (2015p. 1475), who state: studying serendipity “contributes to our knowledge of information interaction through the investigation of experiences in which information finds the individual, not solely experiences in which information is actively sought”.

This is consistent with what Kotkov et al. state, that is, serendipity “occurs when a user acquires useful information while interacting with a node of information for which there were no explicit a priori intentions” (Kotkov, Medlar, & Glowacka, 2023, p. 386)

Research, be it in science or for satisfying a mere curiosity, is to remain open to surprise, as in E Cunha et al. (2010, p. 328),

“Serendipitous discovery, as we have argued, does not emerge from what is already thought and known and its systematic application. It is not generated by systematic disconfirmation processes. Instead, the essential nature of serendipity is surprise. In its effort to reduce uncertainty, organizational scholars have almost ignored the role of surprising and serendipitous events. It is time, we suggest, for theorizing to reconsider the role of surprise and serendipity and we offer this paper as our contribution in that direction”.

By studying serendipity, one notices the pivotal role of unexpected observations, critical assessment, and adaptability in scientific advancements (Meneses, 2023, p. 1074), as well as the importance of recognition of anomalies, as in Fleming’s remarkable history.

In what concerns recommender systems, Kotkov et al. (2023) alert that “overspecialization happens when a user cannot discover new kinds of items as the recommender system only suggests items similar to what the user usually consumes” (Kotkov et al., 2023, p. 386)

Regarding control, as says McBirnie (2008, p. 614), the study “explored the paradox of control inherent in the process-perception duality of serendipity, proposing a potential role for information literacy education in promoting the ability to gain some control of the perception aspect of serendipity”, which leads to the possibility of whether or not it is possible to educate for serendipity.

Education cannot focus directly on serendipity, but can contribute to achieving and maintaining an open mind, enhancing curiosity, thus favoring accidental discoveries.

As a closure, the word of Augras (1972), a French-Brazilian author: she defines serendipity as the “ability to take advantage of hazard”. The author highlights the importance of not just the time the individual spends trying to solve a problem, but also [a time] when he or she is focusing on something else other than the actual problem. As in creative process, this points to the importance of switching the focal point, offering it to themes not directly related to the main object of study, even when those may seem futile to the problem solving process.

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