

## Article

# Beyond Disenchantment: How Science Awakens Spiritual Yearning

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**Abstract:** Scholars of secularization suggest that while the processes of disenchantment and the delegitimization of religious institutions have weakened religious belief systems, they also produced, as an unforeseen result, a renewed awakening of spiritual and existential longing. From this perspective, the search for meaning and spiritual yearning in contemporary Western societies is not simply a residual feature of human experience; rather, it emerges with new strength and urgency as an unintended consequence of secularization itself. Scientists, who are typically perceived as carriers of secularization, are an important population in which to study this phenomenon. How is spiritual yearning manifested among scientists, and what are the differences between religious and non-religious individuals? How does spiritual yearning fit within the broader context of scientific inquiry? Does science suppress spiritual yearning—as suggested by the classical thesis of disenchantment—or stimulate it? Additionally, can science offer a framework that allows scientists to explore their spiritual or existential desires outside traditional religious systems? To address these questions, we draw on data from 104 in-depth interviews conducted in 2023–2024 with biologists and physicists across four countries: India, Italy, the United Kingdom, and the United States. Through qualitative analysis, we examine how spiritual yearning intersects with scientific inquiry, and illuminate how scientists navigate and express their search for meaning in a secular age.



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## 1. Introduction

The search for meaning is considered a fundamental dimension of the human condition and an anthropological constant that occurs in every age and place (Gehlen [1940] 1988; Plessner [1928] 2019; Berger 1967), also in the form of tension toward a “cosmic” (Berger 1967) dimension of mystery, “ultimacy” (Tillich 1951), and “fullness” (Taylor 2007). From this perspective, it would not be easy to imagine a society that completely abandons the religious and spiritual dimensions of life in favor of rationality and material progress, as was predicted by the so-called classical theses of secularization (Acquaviva 1961; Berger 1967; Bruce 2002; Wilson 1985). Scholars have more recently pointed out that the search for meaning and spiritual and religious yearnings do not persist in Western societies only as a residual of an ineliminable component of human and social experience; they also manifest themselves with new strength and urgency as an unintended consequence of secularizing forces as well. According to these authors, secularization generates “cross-pressures”

that make the landscape of contemporary societies appear complex, multifaceted, and even contradictory (Taylor 2007; see also Joas 2014; Gregory 2012). While, on the one hand, the process of disenchantment and the delegitimization of religious institutions lead to a weakening of belief, they also simultaneously produce, as an unforeseen result, reactions in the opposite direction. For Berger (2014, p. 314), for example, the collapse of the sacred canopy encourages a new longing for cosmic, all-encompassing meaning that lies beyond “secular discourse”. Remmel and Sillfors (2018, p. 9) argue that “when the traditionally dominant factors of the scene begin to deteriorate [...] alternative meaning-making” emerges. Watts and Houtman (2022) note that a more individualized expression of religion—called “religion of the heart”—signals a way for seeking meaning in life as a response to disenchantment. For these reasons, according to Taylor, the secular age is characterized by attempts of meaning-seeking through which “more and more people” are “trying to find a faith which will speak to them” (Taylor 2022, p. 196).

Secularization, far from being reducible to the erosion of spiritual and religious content, produces a mismatch between existing belief systems and the subjective search for meaning carried out by individuals (Pace 2011). This mismatch gives rise to what Pace (2011) calls a “surplus of meaning” that, as a result, occurs beyond traditional belief systems. ‘Spirituality’ can be understood, in terms of Luhmann’s systems theory adopted by Pace, as a surplus of meaning that animates the broader “environment” of a belief system. In this way, it helps to transcend dichotomies such as ‘religious and secular’ and ‘sacred and profane’.

In the broad spectrum of possible ways of relating to mystery and ultimacy that are unfolding in secularized societies—shaped in part by the dynamics of religious pluralism (Berger 2014)—it is important to investigate spirituality beyond traditional religious institutions, including in the secular domains of social life (Cadge et al. 2011; Cornelio et al. 2021; Giordan 2016; Woodhead 2012). The category of “spiritual but not religious” (Caterine 2019; Hollywood 2010; Palmisano and Pannofino 2021; Palmisano et al. 2021) has become a key analytical tool in the sociology of religion, offering a framework for studying these evolving expressions of spirituality (Steensland et al. 2021). However, if we intend to really overcome the dichotomies between ‘religious and secular’, it is worth investigating the spiritual dimension even where actors do not explicitly embrace the label ‘spiritual’. If it is true, with Bailey (2008), that there is an implicit religion, there may be an implicit spirituality as well.

Building on this perspective, we propose ‘spiritual yearning’ as a valuable category for studying implicit or latent forms of spirituality among those who do not overtly identify as ‘religious’ or even as ‘spiritual’. In a context such as that of contemporary secularized societies in which religion and spirituality appear to be constantly “in motion”, this category can help us to capture these phenomena in a more dynamic dimension—that of desire, “tension toward”, and longing. Yearning has long been recognized as a fundamental human experience, often associated with longing, desire, and the search for something beyond oneself. In the Western tradition, philosophers and spiritual writers alike have described this deep, often restless desire as a motion of the soul toward its natural telos (Oliver 2006), an “inconsolable longing” (Lewis 1955, p. 72), or a yearning for union and a more perfect world (Cain 2022, p. 36). This yearning can take spiritual forms, reaching toward higher things—such as truth, beauty, and transcendence (Chandrasekhar 1990; Varga 2021)—as well as deeper connections to self, others, nature, and God (Meraviglia 1999; Dyson et al. 1997).

We thus define spiritual yearning as the desire for both deeper connection—to oneself, others, nature, or God—and higher meaning, encompassing a longing for transcendence beyond the self. This yearning may manifest through experiences of aesthetic emotion, spirituality, mysticism, enchantment, or encounters with the transcendent, reflecting a

fundamental drive toward self-transcendence, i.e., the desire to find something that lies beyond the boundaries of one's self (Algoe and Haidt 2009; Elliot and Thrash 2010; Yaden et al. 2017). In Taylor's (2007) words, spiritual yearning can be understood as a desire for "fullness" that surrounds individual existence with meaning, orienting one's motivations, feelings, and actions. This sense of fullness may occur in the secular age both in traditional ways, which imply reference to ontological transcendence, teleological goals, or supernatural entities, but also within the immanent frame, and can be solicited by dissatisfaction with an absence of deeper meanings. In this sense, the word 'yearning' also expresses the sense of lacking that can give rise to a search for meaning and that we have seen to be central in secularized societies.

## 2. Spiritual Yearning in Science

If disenchantment can—unexpectedly—encourage the need for 'higher things', namely, for a meaning that transcends the strictly material dimension and the logic of calculation and empirical evidence, then one sphere in which to investigate spiritual yearnings is precisely science: the place considered since Weber to be one of the major agents of disenchantment.

Science constitutes a privileged sphere for investigating spiritual yearnings also because some of these yearnings have been identified as both catalysts of science and 'touchstones' of the spiritual or transcendent, including unity, truth, goodness, and beauty (Chandrasekhar 1990; Varga 2021; Wragge-Morley 2020); awe and wonder (Fuller 2006; Sideris 2017); and love, death, the self, and the soul as relevant to being, becoming, transcendence, and the sense of beyondness (Rowson 2017). In confirmation of this hypothesis, other studies have shown that several scientists do not share a conflicting view of science and religion (Ecklund et al. 2019) nor of the relationship between scientific questions concerning the empirical world and existential questions about what lies beyond that world (Nicoli 2024).

Moreover, many scientists express forms of spirituality and also "enchantment" (Nicoli et al. 2024) that they articulate in multiple ways. According to Ecklund et al. (2019), spirituality can act as a bridge between scientific knowledge and the religious dimension (see also Watts and Houtman 2022). In addition, it can also provide an opportunity for atheistic scientists to cultivate a search for meaning that is not restricted exclusively to the rational and empirical level. For example, "spiritual atheists" are those subjects who may see spirituality as a way to make sense of their scientific work or as a source of personal meaning, even if they do not believe in a traditional conception of God (Ecklund and Johnson 2021). As Di et al. (2020) argue, alternative spirituality can provide scientists with a sense of meaning and purpose that motivates scientific inquiry, frameworks for interpreting findings, community and support for scientific endeavors, and sources of inspiration for new ideas and approaches to scientific problems. The same applies to enchantment, which is articulated by scientists in transcendent, immanent, and even "liminal" modalities, the last two being particularly expressed by nonreligious scientists (Nicoli et al. 2024).

These observations encourage an investigation of spiritual yearning among scientists. While the existing literature suggests that scientists may experience spiritual yearning, often mediated by the broad and flexible category of spirituality, the relationship between science and spiritual yearning remains an open question. How does scientific inquiry shape, suppress, or stimulate this yearning? Does science 'shut down' spiritual yearning by offering satisfactory answers within the logic of calculation and empirical evidence, as the classical disenchantment thesis holds? Or, can science help evoke or even foster spiritual yearning in scientists? We know from the literature, including from attempts to overcome the conflict between science and religion (e.g., Harrison 2017; Evans 2011, 2013; Evans and

Evans 2008), that only a scientific component within science, but not science as a whole, seeks to replace religion in its attempt to answer ultimate questions from a materialistic and mechanistic perspective (see Woodhead 2017; Curry 2023). Conversely, science might elicit spiritual yearning among some scientists; for example, by showing the limits of human knowledge, by arousing wonder and awe for observed phenomena (Nicoli et al. 2024; Ritz et al. 2024), or by becoming a source of higher meaning beyond the mundanity of research, as suggested by the fact that the overwhelming majority of scientists (whether spiritual or not) see scientific work as a calling (Wrzesniewski et al. 1997) and as one of the most meaningful aspects of their lives.

The main objective of the present study is to better understand how spiritual yearning intersects with scientific inquiry in shaping the way scientists experience and express their search for meaning. This aim, therefore, concerns the advancement of sociological knowledge of religion and spirituality and specifically their current manifestations in secular contexts. Furthermore, the aim also concerns the advancement of sociological knowledge of science: as suggested by scholars in Science and Technology Studies (see Pinch 2021), the current vision of science still neglects integrations between the scientific dimension and, for example, aesthetic, ethical, spiritual, and religious ones. In this sense, the objective of the current study is cognitive, addressing the scientific communities of the authors. At the same time, it is also cultural since it wants to contribute to modifying the social imaginaries on which contemporary societies are based, showing that there are desires and concerns and modes of meaning alternative to those contemplated by an exclusively immanent frame.

To meet this aim, we draw on data from 104 in-depth interviews with biologists and physicists across four countries: India, Italy, the United Kingdom, and the United States. Through qualitative analysis, we examine how spiritual yearning intersects with scientific inquiry and illuminate how scientists navigate and express their search for meaning in a secular age.

### 3. Methodology

The primary research question driving this study is as follows: How does spiritual yearning manifest among scientists, and what are the differences between religious and non-religious individuals? We expect that religious individuals might interpret their yearning through their belief systems, while non-religious scientists may allow science to shape their spiritual expressions in unique ways. The secondary question is as follows: How does spiritual yearning fit within the broader context of scientific inquiry? Does science suppress spiritual yearning, as suggested by the classical thesis of disenchantment? Or, does it stimulate it through experiences of wonder or awe? Additionally, can science offer a framework for interpreting the “surplus of meaning” (Pace 2011), allowing individuals to explore their spiritual or existential desires without relying on traditional religious systems?

Data were collected from an international study which entailed 104 in-depth interviews, conducted between November 2023 and May 2024, with biologists and physicists across four countries: India, Italy, the United Kingdom, and the United States.

Participants were recruited from a previous international survey of scientists conducted in 2021 who agreed to be re-contacted for in-depth interviews. When inviting participants, we described the project as “a study designed to investigate the deeper motivations that drive scientific inquiry, experiences that scientists find profoundly meaningful, and obstacles to achieving a sense of connection and fulfillment”, and did not explicitly mention spirituality in order to avoid any bias against the term. Prior to the interview, we asked respondents to ponder the following prompts: “(1) Think of times either in your work as a scientist or elsewhere when (if at all) you felt a profound sense of connection with

(i) nature, (ii) yourself, (iii) others (iv) and/or God or a higher power. (2) Do you ever feel a desire or yearning for deeper connections in these areas? If so, what, if anything, do you do to achieve those?" In the interview guide, we probed into experiences of (dis)connection with nature, self, others, and God or a higher power; spiritual yearning; (dis)enchantment; mystery; and meaning. We focused on eliciting anecdotes from respondents' lives exemplifying their experiences related to these topics, over and above their beliefs. Interviews typically ran 60–90 min. Table 1 summarizes key demographics of the in-depth interview sample. The "spiritual identification" category below reflects the interviewer's assessment based on the interview.

**Table 1.** Demographic Overview.

| Characteristic                  | N   |
|---------------------------------|-----|
| Spiritual Identification        |     |
| Spiritual but not religious     | 40  |
| Neither religious nor spiritual | 29  |
| Religious and spiritual         | 29  |
| Religious but not spiritual     | 6   |
| Country                         |     |
| India                           | 25  |
| Italy                           | 27  |
| United Kingdom                  | 25  |
| United States                   | 27  |
| Discipline                      |     |
| Biology                         | 56  |
| Physics                         | 48  |
| Gender                          |     |
| Female                          | 37  |
| Male                            | 66  |
| Non-binary                      | 1   |
| Total                           | 104 |

From a methodological standpoint, our research followed a two-phase approach within a mixed-methods framework, specifically adopting a sequential exploratory research design (Creswell and Plano Clark 2011) to integrate qualitative and quantitative phases.

As is well known, in-depth interviews (Bryman and Burgess 1994) often produce themes that emerge not necessarily in direct response to specific questions but rather at various points throughout the conversation (Deterding and Waters 2021; Savin-Baden and Major 2013; Silverman 2006; Strauss and Corbin 1998). This phenomenon is particularly evident when respondents introduce themes initially scheduled for discussion later in the interview. The spontaneity of these thematic introductions highlights the dynamic nature of in-depth interviews, underscoring the importance of flexibility in addressing themes as they naturally unfold.

After verifying the accuracy of each transcription, we uploaded all transcripts—along with the interviewer's post-interview notes—into ATLAS.ti, a qualitative data analysis software. By iterating between our field diaries, interview data, and content analysis, we were able to effectively navigate the extensive qualitative data collected in this study. To systematically manage this complexity, we developed a coding scheme based on the key themes emerging from the interviews. While reviewing each transcript, we used ATLAS.ti to tag relevant passages with corresponding codes. This "broad bucket" coding strategy allowed us to capture both anticipated and spontaneously emerging themes, helping to reduce and structure the data for subsequent rounds of analysis.

For the purposes of this paper, we focus on the code “YEARNING”, which comprises 322 text segments labeled accordingly. This code encapsulates the concept of yearning, addressing both the presence and absence of experiences related to spiritual longing. It includes reflections on deep-seated desires, a sense of seeking, and existential or spiritual aspirations. It also includes their responses to what they personally associate with the word “yearning”. These 322 text segments are distributed in a balanced manner across gender (F: 137, M: 184), country (IN: 34, IT: 96, UK: 92, US: 99), and discipline (Biology: 135, Physics: 186).

To analyze these 322 text segments coded as “yearning”, we applied a topic detection method to classify the text portions into distinct topics. Specifically, we used the algorithm developed by Reinert (1983), implemented in the R-based version of Iramuteq (Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires) (Ratinaud 2014; Ratinaud and Marchand 2015). This automated classification of text segments proved valuable for identifying recurring topics—what Reinert (1993) refers to as “lexical worlds” characterized by distinct vocabularies, which can be interpreted as latent variables, offering deeper insights into the textual data.

The procedure consists of several stages (Sbalchiero 2018). After importing the corpus, composed of our 322 text segments labeled as “yearning”, each of which represents an elementary context unit (ECU), the algorithm begins by identifying co-occurrences of words within each ECU. This is accomplished through the construction of a contingency matrix (words  $\times$  units), which serves as the basis for assessing similarities between different ECUs. To proceed with the classification of ECUs into topics, the algorithm employs descending hierarchical cluster analysis, which is based on a sequence of correspondence analyses (CA) (Greenacre 1984; Lebart et al. 1984) and the  $\chi^2$  distance between topics (Reinert 1983). Finally, for the purposes of the present paper, the results are used to assess the topics’ grade of association with the modalities of the variable “spiritual identification”, thus allowing us to interpret semantic classes by answering the question “who says what”: if a topic is discussed more by a scientist who identifies as religious, then the positive differences and the threshold for the significance of  $\chi^2$  will indicate an association between that identification and the topic. The outcome of the classification is a set of topics, i.e., semantic classes, that group together words relevant for interpreting each class, which we interpreted by referring to the text portions most closely associated with each topic, as we will see.

## 4. Results

The classification of portions of text labeled as “yearning” led us to identify two main topics, both of which reflect distinct ways in which individuals articulate spiritual yearning, depending on their self-identification within specific spiritual and religious categories. This classification highlights how the quest for meaning manifests in fundamentally different ways, shaped by either adherence to institutionalized faith or detachment from it. Each topic contains unique thematic nuclei that reflect distinct orientations (see Table 1 for a schematic representation of spiritual desires among scientists in non-religious and religious scientists).

### 4.1. Spiritual Yearning Among Nonreligious Scientists

The first topic shows an orientation that is primarily associated (based on the contributions of  $\chi^2$ ) with scientists who identify as either Spiritual but not Religious or Neither Religious nor Spiritual. More specifically, this topic highlights how scientists frame their understandings and experiences of yearning through a vocabulary that conveys an ongoing, fluid, and deeply personal exploration of meaning and transcendence. For these scientists, yearning appears to be closely tied to personal growth, existential questioning, and a search



as it is a “really deep and fundamental” investigation “about the universe”. The scientist further clarifies that this yearning has nothing to do with “classical religion stuff” (ID\_US-P-M-RNS-23027).

A key feature of this perspective is the emphasis on personal inquiry and intellectual curiosity. Words such as ‘question’, ‘curious’, ‘sense’, ‘associate’, and ‘explore’ indicate that these scientists often engage with spiritual yearning and spirituality through reflection and investigation rather than through adherence to established religious traditions. This suggests that spiritual yearning, for them, is not about accepting predefined truths but about actively seeking and constructing meaning through experience and introspection. The inclusion of ‘invoke’, ‘define’, ‘search’, and ‘express’ in their discourse highlights the dynamic nature of their spiritual process, wherein personal discovery, reinterpretation, transformation, and new experience play a central role, as the following interviewee said

“Maybe experiencing something that you’ve experienced before, but also in a different way. So, routine, but also novelty in it, because you can do the same thing over and over again, but also every time you can experience something different or see something different in it. . . and depending on your experiences or the current state of mind, you might interpret it in a different way. So, you find a new meaning, although it’s something that you’ve seen before”. (ID\_UK-B-F-SBNR-12174)

Similarly, another biologist expressed it this way:

“I think we are deep down in the end trying to understand how things work and why they work the way they work. And how we go about it, it’s all different, and some scientists can say they don’t believe that it is spiritual. But I think it is. Deep down we’re really trying to understand, why are we here and why do we exist? And what helps us exist? Those are things that are all important, and whether or not God is responsible for that, that’s the question for. . . I don’t think we’re ever gonna be able to answer. But I think understanding the unexplainable in a sense is understanding how we’ve been created by a higher power” (ID\_US-B-M-SBNR-SB27).

At the discussion level (see Table 2, Section 4.3 below), in order to further differentiate the expressions of spiritual yearning, we must distinguish between two subcategories within the broader category of nonreligious scientists. On one hand, scientists who are Neither Religious Nor Spiritual (N) typically express their yearning through intellectual curiosity, awe in scientific discovery, or a desire for existential understanding without explicitly framing it as ‘spiritual.’

For instance, one US physicist remarked.

“I’m old enough that I realize I’m not going to live long enough to understand all the things I wish I could understand. So, in that sense, it’s a yearning. A yearning to understand things more things than I know about things that we mentioned. Is there something higher dimensions of us, and what’s going on? What does the Big Bang mean? What’s are there other big bangs? Are there parallel universes? We would like to know those things and I’ll never know them” (ID\_US-P-M-N-23896).

We should note, moreover, here that some of these scientists (N) understand the concept of profound connection but do not claim to need or experience it. As one scientist shared,

“I think you’re after something more profound than I have ever felt. So, I mean, yes, it feels very good to have a free ranging conversation with someone who is of sufficiently like mind that we can actually have a meaningful conversation, but of sufficiently different mind so that we can each learn from that conversation. And I’ve enjoyed those conversations very much every time they’ve occurred. But, I think this is different from what you think



you're trying to get at.... You're... talking about something that is not part of my nature" (ID\_UK-B-F-N-13019).

On the other hand, many Spiritual But Not Religious (SBNR) scientists openly acknowledge spirituality in their discourse, often linking their scientific work to broader transcendent experiences, as an SBNR biologist noted, "I feel moments of communication and contact with the spiritual world" (ID\_IT-B-F-SBNR-6267), revealing a more explicitly spiritual interpretation of yearning.

Moreover, the emotional and existential depth of this orientation is reinforced by words such as 'peace', 'wonder', 'awe', and 'beauty'. These terms suggest that spiritual yearning, for SBNR individuals, is often connected to profound emotional experiences, moments of insight, and an appreciation of the mysteries of existence. These scientists, indeed, find spiritual fulfillment in experiences of beauty and existential reflection, especially solicited by nature (e.g., the sea, mountains, deserts, or specific empirical phenomena or processes that scientists observe during their work). Nature, therefore, appears to be an important medium through which these scientists experience their spirituality, to the point that some consider people as an obstacle to connecting with it, as the following sentence illustrates.

"I definitely wish I had more. . . I think I tend to feel the connection to nature and sense of awe most when I'm in places like deserts or mountain tops or something like that where there are no human structures and even it's not really a place that a person could live. Then I think maybe the feeling that I get is like, wow, it's amazing that these kinds of places exist, and we, as humans, barely get to experience them at all. I think because of the nature of those kinds of places". (ID\_US-B-F-N-19025)

Similarly, a nonreligious English biologist points out that nature is associated with spiritual yearning because it allows him to make space within himself, leaving out worldly concerns and focusing instead on what is truly important. Through nature, he can connect with what is radically different from himself since it is not temporary but eternal, thus putting everything into perspective:

"Sometimes when things are just crowding in on you, you just want to go somewhere, and for me, a different space, a different place where these things don't matter. And for me, I usually find that by the side of the sea or something like that [ . . . ] for me, that's super calming, even, when it's rough and cold and horrible because it's almost like you're looking into infinity. There's nothing there, it moves all the time. So, it's always changing, but it's always the same thing you can rely on it. [ . . . ] I think that is the most deep feeling of yearning that I have" (ID\_UK-B-M-N-2035)

This view also aligns with broader existential concerns, as indicated by terms like 'truth', 'existential', and 'concern', which imply that, for these scientists, spiritual yearning is deeply intertwined with fundamental questions about human purpose, mortality, and the nature of reality, which in many cases arise in scientists from a 'trigger' that comes from scientific practice itself, as in the following example:

"Spiritual yearnings come to me, for example, looking at cuttlefish. That is, the questions that arise when you get to touch the cultural level of animals like this lead you to question several things. They are really rare moments, though" (ID\_IT-B-M-N-6347)

For an Italian biologist, life's big questions, such as Who are we? Where do we come from? What is our purpose?, which express his spiritual yearning, were central to his intellectual and personal journey:

“I recall a few years ago when I was a little younger. At the time when I was choosing biology, I had the ambition to study and understand certain things. At that time certainly, I asked myself a lot of questions. I didn’t give up asking those questions because I got older, I just have a different approach now. The questions are unanswered anyway. A very mundane moment is looking at the starry sky in the middle of a desert. That is a moment when those questions resurface. In these moments thought resurfaces in my conscious mind. The questions are who we are, where we come from, what we do, and so on. . . So, these moments are there, but they don’t culminate with the realization that maybe I should go to church or talk to someone about it”. (ID\_IT-B-M-SBNR-SB12)

The scientist describes moments of profound connection with the universe, such as gazing at the starry sky in a desert. These experiences reignite their existential questions, highlighting the interplay between scientific inquiry and a deeper, almost spiritual sense of wonder. Such moments evoke a universal human longing for meaning, which transcends the boundaries of science alone.

Interestingly, the vocabulary used by these scientists also suggests an active and evolving approach to spiritual yearning. Words such as ‘activity’, ‘feel’, ‘understand’, ‘relation’, and ‘internal’ indicate that spiritual engagement is not a passive state but an ongoing process that involves emotional, intellectual, and relational dimensions. For instance, an Italian biologist says that for her, spiritual yearning is about “moments of communication and contact with the spiritual world” that she experiences under certain conditions; for example, when ascending into the mountains (ID\_IT-B-F-SBNR-6267).

The interviewee also adds that for her, this kind of experience can also be solicited or sustained by the presence of the people she loves. This means that, as we mentioned before, although some scientists underline that spiritual yearning is a solitary process—and the more they are isolated, the more they can feel the connection with a spiritual dimension—for others, spiritual yearning has a social dimension. An Italian biologist, for instance, mentions the importance of sharing moments in nature in the company of her husband (ID\_IT-B-F-SBNR-6764). An Indian biologist associates her spiritual yearning with the opportunity to spend time with her family (ID\_IN-B-F-SBNR-2659). For one of her colleagues, spiritual yearning means to reach “a certain purity of human spirit where fundamentally you are able to put others and a collective above oneself as an individual” (ID\_IN-B-F-SBNR-3073).

Therefore, although it is true, as the literature suggests, that spirituality appears to be a subjective and self-directed experience, in contrast to traditional religious structures that emphasize communal beliefs and external authority, at the same time, the spirituality of non-religious scientists is not always individualized but involves a connection with others to varying degrees.

Another significant aspect of their discourse is the tension between certainty and ambiguity. Words such as ‘miss’, ‘guess’, ‘satisfy’, ‘resonate’, and ‘grief’ suggest that spiritual yearning is often accompanied by a sense of uncertainty and an acknowledgment of the limits of human understanding. As one Italian scientist expressed it,

“What is [yearning] for me? Always the connection aspect. There is certainly something more complex than what we see. We feel we are part of it, but we don’t really understand where we are, or how we are. There are times when belonging is clear. Some people experience that in different places. Some in love relationships, some in suffering, which is why I was telling you about those people who go around helping others. I was in Kosovar refugee camps during the war. You can feel the suffering; I understand the people who go there to help. Because there you feel the connection with others. Different people see this spirituality in different places. I think I felt it in nature because I am particularly

connected to it. ... Because humankind is not enough for me. We are just another species out of one million eight hundred thousand". (ID\_IT-B-F-SBNR-6764)

We can see in her claims and those of other SBNR scientists a contrast with the more definitive claims of religious traditions, where faith is often presented as a source of certainty and guidance. Instead, the SBNR perspective embraces ambiguity, seeing it as an essential part of the spiritual journey rather than something to be resolved or eliminated. Furthermore, the inclusion of terms like 'link', 'extent', 'forward', 'current', and 'constant' highlights the dynamic and evolving nature of their spiritual beliefs. This suggests that, rather than adhering to fixed doctrines, these scientists perceive spirituality as a continuous process of transformation and growth. The presence of words such as 'physical', 'art', and 'law' also indicates that their understanding of spirituality is not purely abstract but is often integrated into various aspects of life, including aesthetics, ethics, and human relationships. The use of words like 'question', 'curious', 'sense', 'associate', and 'explore' denotes a reflective and inquisitive approach to one's spiritual journey which emphasize the dynamic and personal nature of spiritual experience.

These semantic patterns reveal that non-religious scientists construct their understanding of spiritual yearning in a complex and multifaceted manner, characterized by introspection, exploration, and a continuous dialogue between reason and transcendence and connection with nature. We should note here, however, that not all nonreligious scientists expressed such yearning for transcendence. As one scientist explained,

"I cannot think as much about a deeper connection with this transcendence, I probably mainly look for it in my research work. Research is given a conscious purpose, which is dealing with a problem in order to find a solution, however that solution doesn't exist in reality as an exact one, it is always approximated. I do not feel more transcendence, but sometimes I feel frustration, because I do not actually think you could see the eye of God, as Spinoza said, in a problem. What we do is much more human, trying find better solutions than previous ones". (ID\_IT-P-M-SBNR-8977)

#### 4.2. *Spiritual Yearning Among Religious Scientists*

The second topic in our analysis is notably different. The thematic nuclei within this category, which is primarily associated (based on the contributions of  $\chi^2$ ) with scientists who identify as either Religious or Religious But Not Spiritual, reveal a distinct way in which these individuals articulate spiritual yearning, integrating their faith with their scientific worldview. Unlike the first topic, where individuals frame their search for meaning through introspection and existential reflection, those in the second topic mainly express spirituality in relation to 'religion', 'belief', and 'God'. Their spiritual yearning is embedded within an established religious framework. This integration suggests that, for these scientists, spiritual yearning is not solely a personal or individual quest but is also deeply shaped by their participation in a larger religious tradition (Figure 2).

A central theme in these scientists' discourses is the relationship between faith and science. While many scientists tend to separate the realm of religion from that of science, for the religious scientists we interviewed, their approach reflects a symbiosis between their scientific pursuits and their commitment to a structured belief system, highlighting how faith and science can intersect in their lives. These interviewees position science as a means of exploring and appreciating the complexity of the universe, often reinforcing rather than challenging their faith. This synthesis is further emphasized by terms like 'learn', 'grow', and 'expand', which, when related to religion or science, suggest an openness to intellectual and spiritual development within the context of their religious commitments. As one Italian biologist put it,



proud of, I would say. And it was that reflection in that moment that I think started a lot of what's happened the last three years". (ID\_US-P-M-RS-SB1)

Another key element in these scientists' discourse is the role of religious practice and community. Words such as 'prayer' and 'community' indicate that spiritual yearning for these scientists is often expressed through structured religious rituals, communal activities, and the social dimension of faith, where religious engagement is not merely a private belief but an active, lived experience that involves service and participation in collective religious practices. This contrasts with the highly individualized spirituality of non-religious scientists. As one Jewish American physicist described it,

"[It's] just part of Judaism, feeling connected with the Jewish community. Because I do find that wherever I go, and I always tend to find it, a group of Jewish people that I have a lot in common, which is by virtue of being a part of that community and I end up spending a lot of time with that community as well". (ID\_US-P-M-RNS-23027)

An American physicist connects his spiritual yearning with the act of praying in a traditionally religious sense:

"Making prayer is being thankful, but also asking for things not a transactional way, but it is a relevant factor in my life, especially during prayer. . . . And then when I feel like doing prayer, I think a lot of—because I guess one of the things that—if you are a believer, you always are repenting and asking for forgiveness and stuff like this". (ID\_US-P-M-RS-SB1)

The language of these religious scientists reflects a sense of spiritual fulfillment and existential reassurance and suggests that their faith provides these scientists with a deep sense of purpose and well-being. Unlike the uncertainty and ambiguity often associated with the spiritual yearning of non-religious scientists, religious scientists seem to derive comfort from the structure and guidance offered by their faith traditions. For some of these scientists, faith can provide a broader framework that gives meaning not only to everyday life but also to scientific work. As one American physicist described his spiritual yearning,

"I think I do often wish that I was more engaged with my Christian faith. Again, in the sense that I think that's a useful lens to focus those feelings through and to practice through. I think that that sense of connection to God is often what helps me take a step back from the daily grind of science and other things in my life. It's like doing dishes and folding laundry and all these things that we have to do to keep going, and reminds me about why I'm doing it and puts me back into the head space of like, what can I do to maximize this feeling? . . . I pray often, sometimes I really feel like I am talking to God". (ID\_US-P-F-RS-22153)

Additionally, there is a strong emphasis on tradition and continuity. The use of religious references symbolizes faith's connection to both the sacred and the natural world, reinforcing the idea that spirituality and science can coexist as complementary ways of understanding existence. One Italian physicist describes how pursuing this yearning, which motivates the scientific pursuit, also helps us address our yearning to know ourselves better:

"This yearning to reach the stars enabl[es] us to understand something about ourselves as well. So, this way of looking further away is really related to human desire. It may seem useless, while in fact it is very useful. It also transcends things". (ID\_IT-P-M-RS-SB2)

Another example is from a UK biologist who describes science as a means to pursue her yearning for connection to God:

“I think yearning is like really wanting a deep connection. I know I’ve definitely experienced it, but it’s like where you really don’t feel fulfilled without trying to meet whatever that thing is that you’re trying to find. . . And I think there’s a yearning where you want to connect deeper with God, like you want to know [ . . . ]. I think there’s value in the actual work you’re doing. I think that through science, there is something that is going to come out that God wants you to do”. (ID\_ UK-B-F-RS-12886)

The language in this category reflects a strong emphasis on personal relationships, and a deep commitment to intellectual and professional growth. The understanding of meaning expressed by this category of scientists is shaped by both internal reflections and external experiences; this indicates that meaning is not solely derived from religious or spiritual beliefs but can also emerge from the complexities and richness of human experience.

#### 4.3. Spiritual Yearning Among Scientists: A Comparison

After analyzing the topics and the thematic nuclei that characterize them, Table 2 synthesizes the key aspects of spiritual yearning among Neither Religious Nor Spiritual Scientists (N), Spiritual But Not Religious (SBNR) Scientists, and Religious Scientists (RS and RNS).

**Table 2.** Spiritual yearning among scientists: a comparison.

|                                     | Neither Religious Nor Spiritual Scientists (N)  | SBNR Scientists (SBNR)  | Religious Scientists (RS and RNS)   |
|-------------------------------------|---|---|---|
| Understanding of Spiritual Yearning | Framed through intellectual curiosity, awe in scientific discovery, and existential questioning. No explicit spiritual framework. | A personal and evolving journey driven by existential questioning, intellectual curiosity, and emotional connections beyond traditional religious frameworks. | Expressed within a religious framework, yearning shapes their search for meaning through faith, practice, and a connection to the divine, whether integrated with or separate from science. |
| Connection and Experience           | Searches for meaning primarily through scientific inquiry and philosophical reflection.   | Emphasizes personal experiences and a search for meaning beyond material reality.   | Expressed through religious practices, rituals, and faith communities.  |
| Science and Faith                   | Science as a tool for understanding the universe; does not necessarily elicit a spiritual response.                               | Science can coexist with spirituality, and scientists may perceive scientific wonders as spiritually meaningful.  | Faith provides comfort, purpose, and ethical guidance, contrasting with the ambiguity experienced by non-religious scientists.  |
| Emotional and Existential Inquiry   | Intellectual and rational approach to meaning; acknowledges uncertainty.  | Personal and introspective; focuses on self-growth, connection, and transformation.   | Provides existential reassurance and moral guidance through faith.  |
| Nature, Awe, and Transcendence      | Finds wonder in the complexity of nature but does not frame it as spiritual.  | Nature could be a medium for spirituality; moments of awe and connection.   | Religious traditions, connection to the divine, whether integrated with or separate from science.   |

As evident from the table, the expression of spiritual yearning can take on different meanings depending on a scientist’s personal perspective, whether they believe in a transcendent dimension or not.

For those with religious faith (RS and RNS), spiritual yearning reflects a desire to understand the divine, seek a higher truth, or reconcile scientific knowledge with spirituality. This can manifest itself as a quest for meaning in the universe. Their yearning, as seen, is also expressed through religious practice and community, where rituals (such as prayer) and collective engagement play a central role in shaping their spirituality. Rather than grappling with uncertainty, their yearning is linked to existential reassurance and fulfillment, as their spirituality involves moral and ethical reflection or guidance, reinforcing self-examination, moral responsibility, and the pursuit of ethical betterment and spiritual maturity.

For those who are Neither Religious Nor Spiritual (N), the sense of yearning—if expressed at all—takes on a more philosophical or existential form, and is primarily shaped by intellectual curiosity, existential questioning, and awe in scientific discovery. However, they do not frame these experiences within an explicitly spiritual framework. Their search for meaning is largely driven by scientific inquiry and philosophical reflection, maintaining a rational and intellectual approach to existential questions. While they experience wonder in the complexity of nature, they do not interpret it as spiritual, and their approach to meaning-making is often individualistic, rather than rooted in shared spiritual or religious communities. Further, some of these scientists claimed not to yearn for anything at all, and suggested a sense of satisfaction with life that did not require a search for anything more or missing.

Spiritual But Not Religious (SBNR) scientists embrace spiritual yearning and spirituality outside the boundaries of institutionalized religion. Their spirituality is personalized and fluid, often shaped by personal experiences of transcendence through nature, art, or meditation. Unlike scientists who are Neither Religious Nor Spiritual, they perceive moments of awe and connection as spiritually meaningful, even though they do not follow a religious tradition. This may involve a longing for connection with something greater, such as humanity, nature, or the cosmos, and can also be expressed as a search for existential meaning through science, a sense of wonder in the face of the universe, or an ethical drive toward the advancement of knowledge and the common good. Their yearning is deeply intertwined with intellectual and existential inquiry, where curiosity, questioning, and openness to multiple interpretations take precedence over predefined truths: this search for meaning is rooted, as we have seen, in experiences of nature, where encounters with beauty and vastness evoke a deep sense of connection.

Despite these differences, scientists who report experiencing spiritual yearning describe it as a profound desire for connection, meaning, and transcendence. In other words, spiritual yearning represents an inner drive toward the mysterious or the sublime, and sometimes, the transcendent. For some, this means seeking God; for others, it involves pursuing answers to life's fundamental questions within an immanent horizon, through science, art, or philosophy.

## 5. Conclusions

In this article, we have argued how contemporary societies are not characterized by a disappearance of the religious and spiritual dimension in favor of rationality and material progress, but by “cross-pressures” that include secularizing and disenchanting drives along with movements that oppose them (Taylor 2007; see also Joas 2014; Gregory 2012). We argued that studying scientists as a population might be especially helpful for understanding this complexity. Are scientists disenchanted, since they are accustomed to privileging the logic of rationality and empirical evidence on which science is based? Or are they inclined to express a sense of spiritual yearning despite—or *because of* and even *through*—their scientific commitments?

Our analysis suggests most scientists do not express a disenchanted view or attitude towards life—or even their profession. On the contrary, they demonstrate a deep interest in the spiritual dimension and the fundamental questions of existence. Above all, they yearn for a meaningful life (both personal and professional) and for a deeper connection with nature, others, themselves, and sometimes, a higher power. As Berger (2014, p. 61) points out, people living in secularized societies are often able to “navigate” between secular and religious realms that can, therefore, “coexist”. The scientists we interviewed by and large do not see science and spirituality as conflicting dimensions with sharp boundaries. Science appears as a reality that is itself complex and encompassing several factors, not just

those that are potentially disenchanting, such as the logic of rationality and natural causal mechanisms. The ability to elicit wonder and awe, existential questions, the inexhaustibility of reality, and the search for deeper meanings are just a few factors that emerged from the interviews that contribute to pushing scientists not toward but beyond disenchantment.

Even where the religious system that traditionally regulated and channeled spiritual yearning has deteriorated—which is only partially true, since a substantial minority of scientists is conventionally religious—spiritual yearning nevertheless persists in new, more personalized and diversified ways. These results support Pace’s theory (Pace 2011) that secularization produces a “surplus of meaning” that no longer fits within the religious system but shapes the broader environment in which religion operates. This shift does not necessarily preclude the possibility of an interaction between religious and non-religious modes of meaning-making.

Most scientists we interviewed expressed a sense of searching and longing for something “deeper” or “higher” that is missing. These results align with Taylor (2007, 2022), who argues that secularized societies are marked not solely by disenchantment but also by a pervasive dissatisfaction with a life and profession that are reduced to purely practical and “prosaic” concerns (Berger 1967). For some of the scientists interviewed, this very dissatisfaction—stemming from conditions of work and life that leave little room for meaningful connection—activates a positive tension toward “higher things,” that offers these individuals the opportunity to cultivate spirituality.

Our data also suggest that spiritual yearning is manifested differently across religious and non-religious scientists. Religious scientists often express spiritual yearning in direct terms, seeing it as an integral part of their personal and professional lives. In contrast, non-religious scientists tend to frame spiritual yearning differently, viewing it through the lens of existential desire, such as deep reflection on nature or the quest for knowledge. Non-religious scientists, even without explicitly framing their feelings in spiritual terms, may express a yearning for a deeper sense of meaning, linking it to an existential drive rather than religious faith.

A key aspect of our findings is the role of distance from religion in shaping these expressions of spiritual yearning. For non-religious scientists, indeed, the absence of a prescribed religious framework allows for a more personal and open-ended exploration of existential questions. In this sense, their yearning takes on a more personalized form, distinct from traditional religious structures. Instead of adhering to dogmatic beliefs, they express a desire for connection to the cosmos, to nature, or to the mysteries of life in ways that transcend conventional religious boundaries. This distance from religion can result in a broader, more flexible interpretation of spiritual longing, where the quest for meaning is not confined by the expectations of organized religion but instead shaped by personal experience and scientific inquiry.

Nonreligious scientists often speak of their yearning for understanding and knowledge, a desire to uncover the mysteries of life and the universe. This pursuit of knowledge can evoke wonder, particularly when contemplating the vastness of the cosmos or the complexity of natural phenomena.

For others, a connection to nature is central to their spiritual yearning, with the beauty and interconnectedness of the natural world inspiring reverence and a desire for environmental preservation. Lastly, the concept of a “surplus of meaning” (Pace 2011)—the idea that existential desires can intersect with spirituality, but in ways that do not necessarily align with traditional religious expressions—was a prominent theme, particularly among non-religious scientists. This concept allows us to understand spiritual yearning as a more personal and subjective experience, independent of traditional religious beliefs (see for example Cadge et al. 2011; Cornelio et al. 2021; Giordan 2016; Woodhead



2012). However, even among them, it is worth noting that some scientists do not always perceive a connection between their work and transcendence. Indeed, some claimed not to experience any yearnings at all. It is difficult to say how much this accurately reflected their experience and how much was due to reticence to discuss such matters in an interview with a stranger.

Through this investigation, we aimed to better understand how spiritual yearning intersects with scientific inquiry in shaping the way scientists experience and express their search for meaning. The results suggest that spiritual yearning in non-religious scientists is not simply a form of disengagement from religion in opposition to institutionalized systems of belief. Rather, it may indicate a positive, active engagement with deep existential questions in ways that transcend traditional religious boundaries. It may even lead some nonreligious scientists to expressing a certain resonance with or affinity for religion, seeing themselves as being on the same fundamental quest for meaning. The research presented, therefore, suggests a shift toward a broader understanding of spirituality, particularly among scientists who do not adhere to the belief in a personal God. This perspective enriches the traditional definition of religion, which is typically associated with institutionalized belief.

This quality of spiritual yearning is in line with Pace's argument that the search for meaning is not simply a leftover or residual element of religion; rather, it is a fundamental part of the broader environment in which religious systems (as well as scientific systems) are situated. Despite their differences, both religious and nonreligious scientists express a fundamental need for transcendence, connection, and existential reflection, demonstrating that spiritual yearning is a shared human experience across belief systems. Whether framed in terms of religious faith or secular inquiry, this yearning reveals a deep-seated drive to explore meaning beyond the material world.

We can then ask does scientific inquiry provide a pathway for engaging with spiritual yearning? Both religious and non-religious scientists use scientific inquiry as a means of engaging with deeper existential questions, though their interpretations differ. For some, science becomes a way to understand divine creation or to pursue a yearning for connection with God; for others, it serves as a tool for exploring the mysteries of existence through uncovering natural laws—and in doing so, to become more deeply connected to nature, to others, or to oneself. Does this suggest that science itself—beyond personal belief—acts as a bridge between the rational and the transcendent, offering a shared pathway for spiritual yearning?

These results thus contribute to dismantling the most widespread representation of scientists in the collective imaginary, which is based on a simplistic polarization between non-religious scientists on the one hand—often atheists and in open opposition to religion, as exemplified, for example, in the almost caricatural figure of Richard Dawkins (who now considers himself both “spiritual” and a “cultural Christian”)—and, on the other hand, religious scientists, often Christians and whose adherence to official dogmas is emphasized more than the spiritual dimensions of their faith—as suggested, for example, by the way Francis Collins is portrayed in the media. By contrast, our analysis shows that the way scientists see and experience the spiritual dimension and connect it to science is much more complex and multifaceted than understood in the collective imagination, highlighting the need for further investigation in this field<sup>2</sup>.

Finally, when viewed within the broader context of the secularization debate, the results support the argument that the process of disenchantment does not simply diminish traditional beliefs but also generates new avenues for meaning-seeking—emerging precisely from the sense of dissatisfaction and absence that disenchantment fosters. (e.g., [Taylor 2007, 2022](#); [Berger 2014](#)). In secular societies, these trajectories of meaning-seeking take

on new and reflexive forms, attentive to the spiritual dimension rather than metaphysical and ontological concerns; they are attuned to subjectivity and engage in dialogue with other spheres of existence (e.g., Watts 2022). Within this framework, science seems to play an important role with respect to spiritual yearning. Even though, as we have seen, some scientists do not express spiritual yearnings, science can still inspire new paths of spiritual and existential exploration, offering a unique spiritual resource for believers and nonbelievers alike.

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## Notes

- <sup>1</sup> The ID is composed of the country (US, UK, IT, IN), discipline (Biology or Physics), gender (F, M, or Other), spiritual identification (SBNR—Spiritual But Not Religious; N—Neither Religious Nor Spiritual; RS—Religious and Spiritual; RNS—Religious But Not Spiritual), and a unique code.
- <sup>2</sup> A scientist who embodies a more nuanced perspective on the relationship between spirituality and science is Albert Einstein. His highly individualized concept of a cosmic religion reflects personal spiritual yearnings that rather diverge from traditional religious beliefs, all while being closely linked to his scientific research. Furthermore, Einstein’s clear rejection of a purely scientific and disenchanting approach has become an important reference point for many scientists (see, for instance, Nicoli 2024).

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