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Good, Bad, or Not-Even-Wrong Science and Mathematics in Transpersonal Psychology: Comment on Rock et al.'s "Is Biological Death Final?"

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Rock et al. (this issue) used a Drake-like equation to provide an estimate of the mathematical likelihood of survival of consciousness after death based on combining a number of probability guestimates. Although it is refreshing to see a mathematical paper within transpersonal psychology, as this subdiscipline of psychology suffers from a shortage of quantitative research, it is uncertain whether this contribution is good, bad, or not-even-wrong science. The original Drake equation, and its derivative Drake-like equation spinoffs, have been criticized for combining numbers that produce results that lack meaning and thereby perhaps can be seen as using pseudomathematics. This concern is discussed in relationship to problems related to romantic scientism within transpersonal science, including methodolatry involved in privileging qualitative over quantitative approaches. Self-expansiveness is discussed as an example of transpersonal psychology appropriately using good science, while the critical positivity ratio is discussed as an example of bad science, and astrology is discussed as an example of pseudoscience that is not-even-wrong. Questions are raised about the proper use and the misuse of mathematics within the transpersonal area, and comment is made about advances in mathematics that might become useful within transpersonal psychology.

Keywords: *transpersonal psychology, survival of consciousness, Drake equation, methodolatry, pseudomathematics, romantic scientism, self-expansiveness, critical positivity ratio, astrology*

"Mathematics is the language in which God has written the universe."

—Galileo Galilei

Rock et al. (2023; this issue) used a Drake-like equation as a framework for mathematically approaching one of the most vexing questions that has long troubled much of humanity: "Is Biological Death Final?" Drake sketched out a simple mathematical algorithm to combine a variety of probability estimates into an overall quantitative appraisal of the possibility of life existing beyond earth. Noteworthy, Drake first offered his equation within a transpersonal context, as the working group wherein this equation first appeared was named the *Order of the Dolphin* after Lilly's seminal work exploring transspecies communications with dolphins (Clarke, 2014). Lilly was a participant in that working group and also an early contributor to transpersonal psychology (see Grof et al., 2008).

Since its appearance at the Order of the Dolphin, many have applied Drake-like equations to understanding a variety of difficult problems, such as college homicides (Boss, 2019) and the progression of cancer (Dujon et al., 2021). These Drake-like equations have also been criticized for frequently introducing variables for which only rough guestimates can be plugged into the equations, leading to what can sometimes be seen as only the appearance of advances in understanding or, worse, can be seen as obfuscation through misusing mathematics. Hartsfield (2014) wrote regarding possible problems of this kind: "The worst thing about the Drake equation is that it gives us a false idea of grasping the problem we are trying to solve. A mathematical equation connotes some

scientific study or understanding of a subject. But this is misleading..." (n.p.). This leads me to reflect on whether Rock et al.'s (2023) paper constitutes good, bad, or not-even-wrong science and mathematics.

Pseudoscience and Pseudomathematics

The demarcation of authentic science from so-called *pseudoscience* (Gordin, 2021) is a vexing task. Many demarcation judgments likely can only be resolved when the hindsight of history reveals which are good, bad, or not-even-wrong science. Scientific explanations, even the good ones, are always wrong in the sense that they are incomplete and subject to revision, as absolute truth can never be found through science. As such, all of science when seen as the search for truth is fated to inevitably be placed in history's dustbin by the next scientific advance, at least as long as science continues. Such an apparently cynical interpretation of science belies, however, that some explanations are more wrong than others, even if none are ever absolutely true. Asimov (1989) described this relativity of degrees of wrongness, as follows: "This is known as when people thought the earth was flat, they were wrong. When people thought the earth was spherical, they were wrong. But if you think that thinking the earth is spherical is just as wrong as thinking the earth is flat, then your view is wronger than both of them put together" (p. 35).

Clearly the less wrong is preferable to the more wrong, even if not true, and all should strive to avoid the wronger than wrong. The leveling of all truth claims as being equivalent in some relativistic jumble is promoted by some in radical postmodernism and leaves only cynicism, rather than a healthy forward-looking skepticism (Friedman, 2002a). One consequence of such cynicism is the denial of science's worth (Lewandowski et al., 2016) as compared to other so-called ways of knowing, which is all too prevalent among some in transpersonal psychology. As each scientific claim needs to be revised for the next more evolved understanding, those who prefer to abide in so-called eternal truths, such as revealed in various religious traditions, can avoid having their darling beliefs scientifically tested through logic and evidence. As to truth claims that lack both sound logic and good evidence, they can

be seen as "not-even-wrong," a term attributed to Pauli (Peierls, 1992) and applicable to pseudoscience and *pseudomathematics*.

Mathematics is simply a form of abstract logic that is internally consistent and not dependent on external referents, such as evidence. As such, it can be argued that mathematics deals with truth in an abstract way bounded by its limited set of assumptions. However, just as there can be pseudoscience, there also can be pseudomathematics. Using logic, whether formal as in mathematics or less formal as found within natural languages, is part of all science, just as much as is empiricism essential to all science. In this regard, qualitative research, which avoids formal mathematics, still relies on logic and evidence and, like quantitative research, can be good, bad, or not-even-wrong. The same applies to other types of scientific methods, such as graphical approaches (Friedman, 2003).

Pseudomathematics is a misuse of mathematics that goes beyond simply making errors. It includes misapplications that mimic the appearance of good and bad mathematics but are not-even-wrong. These are often an attempt to make theories and findings seem more legitimate than they actually are, due to the respect that mathematics commands. Psychology has long been sensitive to the problems posed by pseudomathematics (e.g., Johnson, 1936). More recently Thomas (2019), when discussing pseudomathematics, warned that "when data are mathematized" ... [it can lead to] "results that are mathematically valid but do not translate to valid empirical conclusions" (p. 85).

There are many other terms related to various types of not-even-wrong science, such as *scientism* (Friedman, 2002b). Scientism uses the outer trappings of science to lend seeming legitimacy to otherwise questionable claims, as can be illustrated using through *cargo-cult science* (e.g., Feynman, 1985), which is a term applied to some subtypes of pseudoscience. This term involves going through the ritualistic but empty motions imitative of good science in order to make something appear scientific, despite that it might be not-even-wrong science. Cargo-cult science gets its name from practices post-WWII in which some previously isolated, and

scientifically uninformed, Pacific islanders, who had grown accustomed to receiving valued cargo from airplanes supplying war fighters, engaged in futile efforts to restore their stream of booty once the war ended and the airplanes stopped visiting. It became common practice for many Pacific islanders to build mock-up airplanes made of cardboard and other discarded scraps in the hopes of luring back the bringers of cargo, which they misperceived as gods from the sky. There is no shortage of efforts in contemporary psychology that are similarly empty of meaning, such as the mindless use of computer programs to ritualistically pump-out impressive-looking statistical results whose meanings are sometimes no better comprehended than was the underlying technology enabling airplanes to fly by the Pacific islanders participating in their futile cargo rites.

Another variant of this ritualistic problem within psychology can be called *methodolatry* (aka *methodolotry*; Friedman, 2003). A good example of this is the ideological clash between the worth of qualitative and quantitative methods as positively evaluated by humanistic (and its related offspring, transpersonal) and mainstream (such as positive) psychology, respectively (Friedman, 2014). I take the position that the method wagon should not pull the horse of science but, rather, vice versa, namely that methods should fit the problem explored and just because we have a hammer does not mean we should treat the world as only being a nail (Maslow, 1966). Rigid adherence to any method as being superior to all others is the idolatrous worship of a method for its own sake, which loses sight of the goal of science, which is the discovery of truth, even if that is an unobtainable ideal and the method used is just a tool to approximate that end. In an adversarial collaboration, I argued against the humanistic (and transpersonal) bias toward qualitative methods (Franco et al., 2008) in favor of a methodological pluralism, and also have shown how the cultures of humanistic (and transpersonal) and positive psychology differ on this divide (Friedman, 2008). I also have argued that this divide should not be seen as incommensurate, but one that can, and should be, be bridged (Friedman, 2014). An alternative to methodolatry is to be open to using

any and all methods or, even better, to incorporate multiple methods if possible through employing methodological pluralism (Robbins & Friedman, 2009). This leads me to ponder whether the use of a Drake-like equation applied to the intractable survival-after-death question might represent a form of methodolatry in which using a mathematical expression represents a way of privileging mathematics as a superior way of understanding this enigma in the attempt to lend scientific legitimacy to something that otherwise might be outside of the scope of scientific inquiry. Science studies natural phenomena, and it is debatable whether the possibility of consciousness after death is unavoidably a supernatural question that may reside beyond what science can meaningfully address (Friedman, 2002b, 2015, 2021), or whether this topic can possibly ever be subsumed within a naturalistic scientific exploration. Examining some uses of mathematics within science in terms of good, bad, and not-even-wrong might provide context for considering the Rock et al. (2023) paper's contribution.

Examples of Good, Bad, and Not-Even-Wrong Mathematics

There are many examples of good mathematics conducted responsibly within psychology, including within the subdiscipline of transpersonal psychology. Without humility, I might offer my own work on transpersonal self-expansiveness (Friedman, 2018a) as an example of a systematic program of research aimed to conceptualize and measure an explicitly transpersonal construct, as well as to apply it in a variety of ways that includes using mathematics responsibly in its exploration. For example, my initial study in this area (Friedman, 1983) included an exploratory factor analysis followed by what I then called a confirmatory factor analysis, essentially providing a built-in replication of the former with the findings from the latter.

There are also many examples of bad mathematics within psychology. One example is the so-called critical positivity ratio, which is the widespread but false belief that there is a unique and optimum ratio of positive as compared to negative affect that can promote flourishing and suppress languishing (Brown et al., 2013). A

precise number (2.9013) was identified as a unique mathematical tipping point, both intrapersonally and interpersonally, and this number was touted as one of the most important psychological discoveries ever (Friedman & Brown, 2018). It falsely was identified as a universal invariant applicable to all human circumstances (e.g., across all cultures and times), wrongfully derived from a famous physics equation which gave it the appearance of enhanced scientific credibility, mathematically misapplied, and hugely influential both within the science of psychology and in the wider world, resulting in over a thousand scholarly citations and over a million Google hits. Worse, it spawned a myriad of high-impact applications that greatly affected the world, despite it being no more rational than building cardboard and scrap effigies of airplanes. However, it was debunked by my colleagues and me (Brown et al., 2013) as simply being wrong, namely the mathematics were misapplied. My colleagues and I labeled this error as a type of romantic scientism (Brown et al., 2014, Friedman & Brown, 2018), and the essence of the critique by Brown et al. (2013) was recently summed up by van Zyl et al. (2023) as, “positive psychological researchers hide unexpected results behind complex statistical analysis techniques and use these to justify the importance of their findings” (n.p.). Whether this ratio was merely wrong or veered into not-even-wrong territory or even wronger-than-wrong is perhaps up for debate, but its debunking clearly showed its mathematics were wrong by being misapplied, and the claim for this being a unique, precise, and universal number was withdrawn (Fredrickson & Losada, 2013).

Astrology is an example of the clear use of not-even-wrong mathematics, as the mathematical sophistry used in astrological calculations is particularly insidious for appearing scientifically legitimate, when it simply is not. Just because astrological charts may involve precise mathematics, and currently these calculations are mostly computerized so appear enhanced by the credibility inuring from that technology, does not make it scientific (Dean et al., 2021). One particularly pertinent critique of astrology is, as an ancient practice found in many cultures that use incommensurate approaches to the same

phenomena (i.e., considering the relationship of celestial objects to the human realm), they cannot all be valid when they contradict each other in so many ways. Astrology may reveal much about how humans project meaning onto celestial objects, whereas deriving meaning from the relationship of these objects themselves back to people is more than tenuous and just does not withstand empirical scrutiny, as shown by a myriad of studies. Likewise, claims of astrology’s validity do not withstand basic logical scrutiny such as, in the Western astrological traditions, attributing bellicose characteristics to the planet Mars simply because of its red coloration (symbolic of blood) and historical association to the eponymous Roman god of war.

Belief in astrology appears unfortunately growing (Das et al., 2022), and this type of nonsense plagues transpersonal psychology, especially in its applied areas, and can cause its critics to be cynical about the legitimacy of the transpersonal area as a whole (Friedman, 2002, 2021). One does not have to look long or far to find self-declared transpersonal psychologists who offer astrological approaches to assessment (astrological divination) and intervention (astrological counseling), such as promoted in a recent paper by Mercadé (2021). Even many transpersonal leaders, such as Tarnas and Grof (see Butler, 2019), openly embrace astrology, endangering the already challenged legitimacy of the transpersonal area from receiving scientific acceptance, and instead bringing derision to all that is otherwise worthwhile in a scientific transpersonal psychology (Friedman, 2002, 2021). As someone who has devoted much of my career to employing scientific approaches to transpersonal psychology, such as by building programmatic scientific research on self-expansiveness, this is very discouraging.

Conclusion

Transpersonal psychology and related transpersonal scientific areas face an existential challenge in terms of their perceived legitimacy, so they need to be more cautious than other scientific areas in terms of avoiding various scientific errors, such as methodolatry, as well as the use of pseudomathematics. Approaches used in applied transpersonal psychology especially need to

scrupulously avoid any possibility of misrepresenting or aggrandizing claims for ethical reasons. This leads me to ponder whether the use of a Drake-like equation by Rock et al. (2023), which is derived from astronomical speculations that bear some similarity to astrology in terms of being based on questionable speculations about celestial objects, might discredit good transpersonal efforts. In this regard, I am concerned that the Rock et al. (2023) paper might similarly cast doubt on the worth of transpersonal psychology through its use of controversial Drake-like equations to speculate about something that might be best contained by being seen as supernatural and deemed outside of the domain of natural science.

I withhold judgment about whether or not Rock et al. (2023) crossed any line in this regard, but I think it is responsible to express concern about where such a demarcation line might be. Many areas of psychology are vulnerable to charges of scientism, while transpersonal psychology is especially vulnerable in this way due to the romantic allure of much of its subject matter. For example, claiming knowledge about, and encouraging pursuit of obtaining, ultimate states that may defy any cogent scientific understanding are fraught with the dangers of romantic scientism. Of course, it is appropriate to study people's beliefs and feelings regarding these ultimate notions, but any claims to directly study these from a scientific framework are highly questionable, and I have intentionally chosen to stay agnostically silent in that arena (e.g., Friedman, 2018b). The tension between romanticism and scientism within transpersonal psychology (Friedman, 2002b) poses a cultural trap (Glover & Friedman, 2015) best avoided when possible in my view, especially when it is blended into a seductive romantic scientism.

The Rock et al. (2023) paper used an empirical strategy to examine the probability of postmortem survival of consciousness, providing a convenient heuristic to frame this vexing mystery, which is innovative and worth considering. However, the survival of consciousness is a topic I personally consider best handled through silence, as echoed in one of my favorite teaching stories (heard orally with published source, if any or many, unknown): A young student of Zen asks an old Zen

master, "What is it like after death?" The master closed his eyes for a few minutes of meditation, and then replied, "That's a question you need to ask a dead Zen master."

Rock et al. (2023) should be lauded for being modest about their use of a Drake-like equation, as they explicitly admit its limitations and acknowledge their use of it as being only a heuristic step. However, just the use of these equations alone could give the wrong impression of transpersonal psychology being a pseudoscience by using pseudomathematics aimed at bolstering the illusion that something more is, or perhaps can be, known about survival of consciousness after death through using a dubious method. The concern is whether using guestimates from empirical probabilities obtained from one domain of knowledge to make inferences about another more elusive domain, which may even be outside of the realm of science, constitutes good, bad, or not-even-wrong science. If mathematics are used this way to organize and make statistical inferences about something that is outside of the realm of science, its use can be a liability rather than an asset by making it appear there is more known than what actually is. This veers into possible not-even-wrong or perhaps wronger-than-wrong territory.

As one of the pioneers and most persistent advocates of the use of scientific methods within transpersonal psychology and other transpersonal sciences (Hartelius & Friedman, 2021), I hope this comment can to some degree ameliorate any potential for harm from the Rock et al. (2023) paper by explicitly acknowledging the danger in such mathematical approaches. I cannot overly emphasize, as its authors responsibly also did, reserving caution about their paper's limitations. When bold claims, such as Rock et al.'s (2023) are offered, they invite careful and skeptical scrutiny. For the integrity of the transpersonal science, such examination and challenge should be welcome, and not seen as disrespectful.

Last, the enhanced use of mathematics poses an intriguing frontier for the transpersonal sciences. Classical (frequentist) statistics are being challenged by alternative (e.g., Bayesian) models, and there is a tremendous growth in innovative mathematical approaches that show great promise for making

better sense of complexity, such as the growing use of artificial intelligence. One such intriguing area involves using fractals within transpersonal science (Marks-Tarlow et al., 2020). The growing potential for mathematics to contribute to the transpersonal sciences also poses many dangers from their possible misuse as pseudomathematics. One such concerning example that has come to my attention recently is with ergodicity in which group-level data may not reflect well on individual-level variation (Fisher et al., 2018). This calls into question many of the basic assumptions and common practices of drawing inferences from group-level data to individual cases, such as within many clinical psychology assessment practices. With profound changes on the horizon in mathematics applied to psychology, as well as to transpersonal sciences including transpersonal psychology, I leave it to the future to reveal how Rock et al.'s (2023) paper will eventually be perceived in terms of good, bad, and not-even-wrong science.

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