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The Myth of Absolute Science
“If it’s published, it must be true”

The Myth

On several occasions I’ve been asked how to differentiate between “good” and “bad” science. It’s an excellent question and I’ll illustrate it this month with the review of a book published 30 years ago. *The Sound of Music and Plants* has been cited by dozens of websites as solid scientific evidence that classical music benefits plant growth while acid rock music has a negative effect. This is even extrapolated to humans on websites with titles such as “How Music Affects Your Kids...What Parents Need to Know” and “Why 'Good Vibrations' May be Bad”. Ignoring the questionable logic in equating plants and humans, an educated non-scientist should be able to look at a publication and begin to determine its validity. Here’s an example of how to approach the process:

The Reality

The Sound of Music and Plants was written by Dorothy Retallack and published by DeVorss & Co. in 1973. The book charts the author’s undergraduate research experience at Temple Buell College (now Colorado Women’s College) under the direction of her biology professor. The actual description of the experiments occurs in the second appendix: the purpose of the book is to blend science with music, philosophy, and religion. This makes for an interesting read, but the reader must view the science in a more objective manner.

Upon careful reading of the above-mentioned book, I had a number of concerns:

- 1) There was no scientific rationale or hypothesis presented; rather, the author exclaims “What in the world can I do with music and plants!” (Her field of study was music; she was required to take a biology course for her degree.)
- 2) Authorities in unrelated fields are cited to give the appearance of legitimacy to the experiments. The author cites the works of several professors and/or doctors, who are experts in fields such as physics and theology, but certainly not in the biological sciences.
- 3) Various claims are footnoted and referenced, but out of the 40 footnotes only two are relevant to the subject of plant growth and sound (not music). The others are irrelevant to the subject matter or are not scientifically valid sources.
- 4) The author anthropomorphizes; in other words, she compares plants to humans in terms of having “likes and dislikes, their feelings and idiosyncrasies.” This is poor reasoning and biases her expectations.
- 5) The author claims that “beyond a doubt the phenomenon itself (the effect of music on plants) has been proven.” Science does not “prove” any hypotheses: it either disproves or supports a set of assumptions. This is why science is constantly changing, as old hypotheses are discarded or amended as we learn more about the natural world.
- 6) The number of replicates is small (four) and not sufficient for statistical analysis. No statistically valid information is provided in the book.
- 7) The experimental design is poor and does not maintain other factors, such as water, humidity, light, etc. at optimal and consistent levels. For instance, the potting containers were Styrofoam drinking cups with no drainage, and watering needs were “determined by touching the soil with a finger.”
- 8) The book is published by a company that specializes in New Age literature, not science.

- 9) The research itself was never published in a peer-reviewed journal, nor has any replication of the work appeared in this body of literature.

The Bottom Line

Here are some criteria to keep in mind when separating science from pseudoscience:

- If the information is in a magazine or journal, is it a **peer-reviewed publication**? Peer review means that independent experts in the field will read and critique the manuscript. By reading the journal's instructions for manuscript submission it is fairly easy to determine if peer review is part of the process. Lack of peer review in a publication should cause the reader to look elsewhere for scientific verification of the claims in question.
- If the information is contained in a book, who is the publisher? What types of books does the publisher produce? Acceptable science is usually published by **academic or scientific publishing houses**, including university presses. Pseudoscience is commonly published by companies with no ties to mainstream science or academia, which includes vanity presses (i.e. self publication).
- Has the **experiment been repeated** elsewhere? When controversial subjects appear in the scientific literature (e.g. cloning), independent researchers will repeat the experiment to verify the original research. Lack of subsequent scientific verification is a red flag; it means that no one else was able to get the same results.
- A hypothesis becomes a scientific "truth" if repeated scientific experimentation has failed to disprove it. The "Laws of Physics" are so termed because they have been exhaustively tested, and have not yet been shown to be false. **The idea must withstand repeated attempts to disprove it.**
- Does the author have an ulterior motive? For instance, is the author attempting to sell a product? Or is the author attempting to sway your thinking on an issue unrelated to science (religious morality, as in the book cited above)? Scientists attempt to **report their results as objectively as possible.**

For more information, please visit Dr. Chalker-Scott's web page at <http://www.theinformedgardener.com>.