Journal of Physical Chemistry & Biophysics
ISSN: 2161-0398
Bourdillon, J Phys Chem Biophys 2015, 5:3
DOI: 10.4172/2161-0398.1000182

Commentary Open Access

The Science of Science and Quasi-science

Bourdillon AJ*
Bourdillon AJ, UHRL, San Jose, CA 95070, USA

Times of change demand examination of what we do in what is called science. The business is twenty three hundred years old with articles that were written by the ancient Greek scientist [1,2] and logician Aristotle [3]. His formal and informal logic has been endorsed down the ages, notably during the enlightenment by Locke [3] and by modern positivists in the Vienna Circle. The first two decades of the twenty first century mark change in the publication of science. Search engines have supplanted one role of traditional journals. Where private publishing was once rare, any one can now publish world-wide at modest cost. Moreover a new set of journals economize with open source e-journals, where costs are passed to authors by modest fees. Authors can even do the typesetting through appropriate use of formatted templates. Incentives have therefore transferred from the cost of editing and typesetting for publishers, to the benefit for open source contributor fees.

The incentives change almost everything. In the course of one or two lifetimes, criteria for selecting articles for publication have changed. The gentleman's club of scientists that was evident a hundred years ago has gone for good. Now, the chatter of the internet has to be filtered by the individual user or corporate grant giver. Ranking of journals might seem to do this, but there are fundamental reasons that test this semblance. Competition for laboratory funds from public purses has replaced the old fashioned enquiry after truth and discovery. Voluntary referees are anonymous and competitively biased. If they are not ignorant of the logic of science, they easily ignore it. Editors are hardly able to question the standards of volunteers that may be hard to find. Anonymity dissipates responsibility. Demands on authors are more rigorous than those on reviewers, including writing clarity, evidence, vague generalization, etc. On occasion, a single word, "flawed" was all that a referee gave for a decision from a top ranked journal. Formal and informal logic says nothing for either anonymous refereeing or journal ranking. Editors that are only capable of falling back on votes of multiple referees are both anti-scientific and myth making-the opposite of what the logic of science sets out to attain. In combination with ambivalous refereeing, ranking likewise promotes myth.

An example of quasi-science is found in quasicrystals, discovered in 1982 [4]. A myth that needs examining is the often cited Fibonacci sequence. This sequence has the property that, at high orders, the ratios between consecutive terms tend to the golden mean τ. Elsewhere, the ratios oscillate about τ. In icosahedral quasicrystals, the diffraction pattern occurs in a restricted Fibonacci series because these ratios are a constant, τ. The series is therefore properly described as geometric and it can be easily indexed in three dimensions, including the diffraction planes in stereographic projection [2]. At the recent APS March meeting in San Antonio, the following question was addressed: how does a periodic probe, such as an electron beam or an X-ray beam, interact with an aperiodic structure to produce a periodic response in geometric space [5]. In crystals, interaction is easy: the periodic probe interacts with a crystal lattice oriented to the Bragg condition, when the overlap is perfect. In quasicrystals by contrast, the interaction can be understood by means of the ideal hierarchic structure, and by taking account of quasi structure factors calculated, by approximation, for a supercluster with 10^8 atom sites. Diffraction occurs at a quasi Bragg angle that is different from the Bragg angle in crystals. The diffraction occurs at maximum overlap between firstly the periodic probe-expressed as a cosine for a centrosymmetric model-and secondly the geometric quasicrystal structure-expressed through the power series expansion of the cosine. From the quasi Bragg angle, a metric is simulated with a value close to $2.5/\tau^2$. The denominator is the geometric periodicity. Interatomic spacings can be accurately measured for the first time, along with many other systematic features.

Quasicrystals lie between crystals and window glass. They all have unit cells: in crystals face-sharing on a lattice; in glass edge-sharing and unaligned; whereas in quasicrystals the unit cells are multiple-edge-sharing, and aligned. In the last, these properties produce, by simulation, sharp diffraction patterns, like crystals; but in a new 3-dimensional, geometric space with a special metric. The atomic density of the cells is extreme in the proper sense of the word. The cell density represents a driving force for the structure. This occupies geometric space like its diffraction pattern. The metric is generic and can be inverted to examine, in principle and with new functionality, periodic structures by geometric probes. Most remarkable about the Nobel Prize for chemistry in 2011 is the fact that neither the structure nor diffraction mechanism was understood. Any structural claim that does not coherently describe the extraordinary diffraction [6] is invalid because this is the principal feature that defines the novelty. Both features were approved by attending membership at American Physical Society March Meetings in 2013 [7] and in 2015 [5]. Yet, written publication of the solution has been delayed many years [8]. That membership was extremely critical of our journals: the *ancien regime* is in danger. While "In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual [9]", change will come to nothing unless refereeing is made scientific, *ad judicium*. There are hopeful signs of a positive trend but more needs to be done to enlighten referees, for example by referring them to the logic, in journal instructions for referees. Information on these rules through coursework would help young scientists raise standards for the next generation, both for their own publications and of the peers whom they review.

References

1. Marmodoro A (2014) Aristotle on perceiving objects, USA: Oxford university of press.
2. Leroi AM (2015) The lagoon, (1stedn) USA: Bloomsbury.
3. Audi R (1999) The Cambridge dictionary of philosophy (2ndedn), CUP.
4. Shechtman D, Blech I, Gratias D, Cahn JW (1984) Metallic phase with long-range orientational order and no translational symmetry, Phys Rev Lett. 53: 1951-1953.

***Corresponding author:** Bourdillon AJ, UHRL, P.O.Box-700001, San Jose, CA 95070, USA, Tel: 01 408 390 6828; E-mail: bourdillona@sbcglobal.net

Received May 04, 2015; **Accepted** May 12, 2015; **Published** May 17, 2015

Citation: Bourdillon AJ (2015) The Science of Science and Quasi-science. J Phys Chem Biophys 5: 182. doi:10.4172/2161-0398.1000182

5. https://www.youtube.com/watch?v=fH2vI_WX-wQ.
6. Bourdillon A J (2013) Icosahedral stereographic projections in three dimensions for use in dark field TEM, Micron 51: 21-25.
7. https://www.youtube.com/watch?v=xD30KF93qio.
8. Bourdillon AJ (2014) The structural solution for icosahedral quasicrystals and seven blunders in quasicrystallography, Journal of Modern Physics *5*: 488-496.
9. Galilei G (1859) Biographies of distinguished scientific men. Boston: Ticknor and Fields.