

Editorial

Panos Macheras*, Caitlin Di Paolo, Yanna Pusica and Eleftherios P. Diamandis

From Camille Νούς to Apollonian and the Dionysian scientists

<https://doi.org/10.1515/dx-2021-0057>

The fictitious (he or she?) French researcher Camille Νούς, with a very rich CV, acquired within a year or so, attracted the interest of the journal *Science* [1]. The surname Νούς relies on a collegial “We” (“nous” in French) but referring above all to the concept of “mind” or “intellect” (“νοῦς”) inherited from Greek philosophy [2]. Νούς is the Greek word for “mind”. However, Νούς is far richer since it is linked with philosophical notions e.g., “νοῦς υγιής εν σώματι υγιεί”, which means “a healthy mind in a healthy body”. According to the inventors, Camille Νούς is a collective individual who symbolizes our deep attachment to the values of ethics and probation through contradictory debate, insensitive to the indicators elaborated by the institutional management of research, and conscious of what our results owe to collective construction [2]. However, the real roots of the fictitious Camille Νούς are immersed in the credit that comes with authorship [2] and its poor quantification based on the number of citations. The ethical dimension accompanying this credit, calls for a closer consideration of Camille Νούς case.

The need for specifying the contribution of each one of the authors of published papers was first pointed out by Professor Spyridon Mouloupoulos and his group in 1983 [3]. Mouloupoulos, who invented the intra-aortic balloon pump

in 1962 [4], was fed-up with his colleagues, directors of the clinics of the Greek University hospitals, who claimed extensive research work without actual participation in the studies published. Mouloupoulos used an intriguing title “For debate ... Individual contributions to multiauthor papers” for his famous work [4]. This article concludes as follows: “It is suggested that the journals require authors to state their specific contribution to a paper, such as original idea, planning, collecting data, writing up, etc.” thus requiring each of the co-authors to specify his/her contribution to the article. We believe that this is the critical starting point for the link between the responsibility and accountability which accompany the credit that comes with authorship. Undoubtedly, scientists, including the creators of Camille Νούς, agree with Mouloupoulos suggestions. Indeed, almost all journals, have now adopted Mouloupoulos’ suggestions and the contribution of each author is an obligatory element of the manuscript’s initial submission.

Over the years, and with the development of electronic recording of citations (such as Google Scholar), the quantification of the contribution of every author to science became “easier”. However, a lot of biases were identified in the assessment of each individual based on the number of citations, and the h-index became one of the metrics for classifying the scientist’s impact [5]. This is so, despite the use of the authors’ contribution requirement from journals. This is the fundamental reason for the creation of Camille Νούς and the concern of many scientists around the world who cannot accept the present system based on mere numbers which do not capture the substance of the scientific work.

We suggest that we now need an additional qualitative reform. To this end, we consider Figure 1, which shows the three sides of the coin; the flat sides of the coin include the scientists who are happy or unhappy with the present system. The former category includes scientists who have many thousands of citations and they likely belong to scientific disciplines with a very large number of members who perform easily repeatable work. This category also includes scientists who write systematic reviews or participate in complex multi-authored papers, leading to very large numbers of citations and high h-indexes. The category of the unhappy scientists includes scientists from small disciplines; here, one can find

*Corresponding author: **Dr. Panos Macheras**, FAAPS, FAIBME, Head, Pharminformatics Unit, ATHENA Research Center, Athens, Greece; and Emeritus Professor, Department of Pharmacy, National and Kapodistrian University of Athens, Athens, Greece, Phone: +30 210 7274026, Fax: +30 210 7274027 E-mail: macheras@pharm.uoa.gr

Caitlin Di Paolo and Yanna Pusica, Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital, Toronto, Canada

Eleftherios P. Diamandis, Lunenfeld-Tanenbaum Research Institute, Mount Sinai Hospital, Toronto, Canada; Department of Laboratory Medicine and Pathobiology, University of Toronto, Toronto, Canada; Department of Pathology and Laboratory Medicine, Mount Sinai Hospital, Toronto, Canada; and Department of Clinical Biochemistry, University Health Network, Toronto, Canada. <https://orcid.org/0000-0002-1589-820X>



Figure 1: The three sides of the coin. On the heads side you will find the happy Apollonians; on the tails side you will find the unhappy Apollonians, including Camille Nous. The edge side represents the risk-taking Dionysians. For more discussion see text.

Camille Noûs and a large number of scientists who have reservations about the present system and therefore support the Noûs notion. The scientists of this category have relatively low number of citations and h-indexes.

The qualitative reform we are proposing relies on the Albert Szent-Györgyi's concept, who realized that "a discovery must be, by definition, at variance with existing knowledge" [6]. He won the Nobel Prize in Physiology or Medicine in 1937 and divided scientists into two categories: the Apollonians and the Dionysians. For Dionysian scientists he used the following definition "scientific dissenters, who explored the fringes of knowledge." According to him, the Apollonians tend to develop established lines to perfection, while the Dionysians rely on intuition and are more likely to open new, unexpected alleys for research. In the same vein, we place the Dionysian scientists at the edge of the coin (Figure 1), while Apollonians lie at the two flat sides of the coin, including both happy and unhappy scientists with the present system. It is suggested, therefore, that scientific journals of different disciplines create a Dionysian section for publishing novel work which "explores the fringes of knowledge" i.e., a study which refutes a long-held theory or opens an entirely new theory, or discipline, or methodology. This will also allow for the qualitative classification of scientists. A Dionysian scientist will have a very limited number of papers in his/her entire career and maybe a large number of papers in the Apollonian section of the journals. This is so, since ideas for a Dionysian article are usually limited for each individual during their entire life. However, the comparison of scientists will not depend any more on the number of citations [5]. Each of the disciplines can create their own classification of scientists using the Apollonian and the Dionysian categories, while today's ugly interdisciplinary comparisons in terms of citations will end. We also quote the wise words of Szent-Györgyi [6]: "The future of mankind depends on the progress of science, and the progress of science depends on

the support it can find. Support mostly takes the form of grants, and the present methods of distributing grants unduly favor the Apollonians". This is an additional reason for implementing the Apollonian and the Dionysian classification system, in order for Dionysian scientists to enjoy the recognition they deserve.

We close by mentioning that the qualitative classification of individuals for their contributions is not limited to science but can be applicable in many other fields such as sports, the arts, business etc. An example from the world of sports illustrates our point. In boxing, there two categories of fighters. The "punchers" deliver very few punches during a fight but even if one lands, it is usually a knock-out. The "boxers" deliver 10–100 times more punches, in hopes that the damage is inflicted by accumulation, not a knock-out.

Research funding: None declared.

Author contributions: All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Competing interests: Authors state no conflict of interest.

References

1. O'Grady C. Who is Camille Noûs, the fictitious French researcher with nearly 200 papers? *Science* 2021. <https://doi.org/10.1126/science.abi5504>.
2. Anonymous. Cogitamus Laboratory. Camille Noûs (Cogitamus Laboratory | Camille Noûs).
3. Mouloupoulos SD, Sideris DA, Georgilis KA. For debate ... Individual contributions to multiauthor papers. *Br Med J* 1983;287:1608.
4. Mouloupoulos SD. Intra-aortic balloon counterpulsation 50 years later: initial conception and consequent ideas. *Artif Organs* 2011; 35:843–8.
5. Pavlou M, Diamandis EP. The athletes of science. *Nature* 2011;478: 419.
6. Szent-Györgyi A. Dionysians and Apollonians. *Science* 1972;176: 966.