Revista de Chimie
https://revistadechimie.ro
https://doi.org/10.37358/Rev.Chim.1949

Jorge Eduardo Hirsch and the Hirsch-index[**]a Personal Chronicle

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Abstract: *The paper tries to find out the working mechanism of birth of one of the nowadays most used scientometric indicators, the Hirsch-index. The effort spent deals with the human feeling called frustration. It is shown how the frustration of a physicist became the basis of an invention of an indicator considered worldwide the best for evaluating the scientific performance of individual researchers.*

1.Introduction

In September 2005 while searching the literature on the internet on another topic, I accidentally came across a paper in the journal *Nature* entitled *Index aims for ranking of scientists* [1]. In this paper *Philip Ball* – a reputed English scientific journalist –found in the *arXiv* database a preliminary paper (preprint) entitled *An Index to quantify an individual's scientific research output* submitted by a physicist named *Jorge Eduardo Hirsch* [2]. Being the founder and Editor-in-Chief of the English language international journal *Scientometrics*, I found the above-mentioned preprint interesting, therefore turned to *Hirsch* by a letter and offered that our journal would readily consider the publication of his paper after being peer reviewed, in case he officially sends the manuscript it to me. *Hirsch* answered by return of mail in a polite letter, saying he regards my suggestion as an honour, but would need some time to make his decision. Then he did not call on for two months, later, in November 2005 his paper – already in the form of a printed article – appeared in the *Proceedings of the National Academy of Sciences, PNAS*, which is considered as one of the world's best multidisciplinary journals [3]. The foregoing does not need too much an explanation. *Hirsch* obviously chose the journal appearing in the USA for the publication of his manuscript instead of *Scientometrics*. His other paper on similar topic entitled *Does the h-index have prediction power*? was published in 2007 also in *PNAS* [4].

It may seem interesting, that *Hirsch* showed up in October 2009 without any notice, and submitted a new manuscript entitled *An index to quantify an individual's scientific research that takes into account the effect of multiple co-authorship* for publication in *Scientometrics.* The editorial office did peer review the manuscript and based on a positive opinion it was published [5].

To have the chronicle complete, it is mentioned that we had to wait for *Hirsch's* subsequent appearance not less than eight years, when answering a paper critical to him entitled h_α*: The scientist as chimpanzee or bonobo* [6] was published in *Scientometrics*, Hirsch submitted a response paper entitled h_α*: An index to quantify an individual's scientific leadership* [7]. This latter one has been also published following a positive peer review.

As seen in each of the Hirsch-publications mentioned the word *index* simply written itself as *index* or as *h-index*. In his papers *Hirsch* modestly remarks that he did not use the letter ***h*** previous to *index* as the abbreviation of his own name. I tried to find out who began to use worldwide the eponymic doublet *Hirsch-index*. In this attempt I failed, but more than a decade later *Schubert and Schubert* discovered [8], that the eponymic designation has been already published as early as 2005 in a Rumanian paper provided also with an English title *The Hirsch-index, a new scientometric indicator for the evaluation of a scientist* [9]. The author of this paper was a Rumanian one active in Bucharest, named *Petre T. Frangopol*.

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[**] *This paper is dedicated to the memory of my friend and former colleague Professor Petrache T. Frangopol*

At the beginning of 2006, the *Google Scholar* database indicated, that Hirsch 's 2005 paper has been cited already in 2006 by 81 papers, more than 21 of which already used the term *Hirsch-index* in their title. According to the *Google Scholar* database the paper on *h-index* published in *PNAS* has been cited from 2006 up to now 8897-times; out of them 601-times in 2019. Other papers by *Hirsch* mainly dealing with physics topics have been cited 28884-times also according to *Google Scholar* (downloaded: 28 July 2019).

The present paper has not intention to discuss the principle, use, essence, advantages, disadvantages of the *Hirsch-index*, since these questions constituted the topics of many papers (Figure 1) [10-16]. We intend to review here the chronicle of the facts and thoughts that prompted *Hirsch* to create his famous index and to outline the circumstances evolved around it.

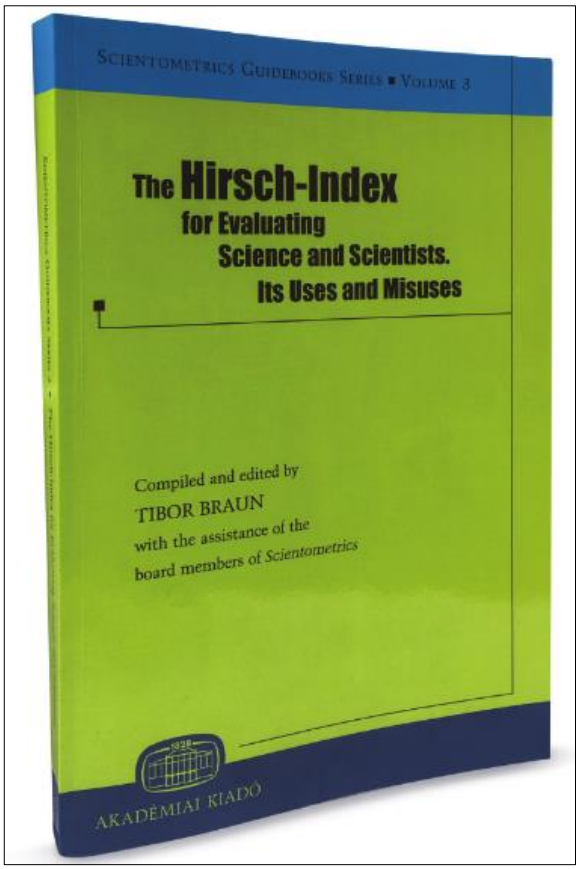

Figure 1. Collection of selected papers dealing with the Hirsch-index [10]

Hirsch's short biography

Jorge Eduardo Hirsch was born in *Buenos Aires (Argentina)* in 1953. He earned a university degree from the *University of Buenos Aires*, and in 1975 a *CONICET* (*National Scientific and Technical Research Council of Argentina*) fellowship. A *Fulbright Scholarship* of the USA was awarded to him in 1976. He went to the *University of Chicago*, where he received a *Telegdi Prize* for the *Best Candidacy Examinee* in 1977. In 1978 *Hirsch* was awarded the *Victor J. Andrew Memorial Fellowship*, too. He defended his PhD-dissertation entitled *Low-temperature thermodynamic properties of a random anisotropic antiferromagnetic* chain [17] in 1980, then started a post-doctoral research at the *Kavli Institute for Theoretical Physics* at the *University of California* (*Santa Barbara*). He joined the *Department of Physics at the University of California (San Diego)* in 1983.

Hirsch's research field

Hirsch's original research fields are superconductivity and ferromagnetism. Almost since the beginning of his activity, but perhaps most distinctly in his papers entitled *BCS superconductivity: the world largest Madoff scheme* [18] and *BCS theory of superconductivity: it is time to question its validity*

[19] he stated that the generally accepted theory of low temperature superconductivity - the *BCS-theory* [20] - is fundamentally mistaken. Instead he suggested a new theory that he named *hole superconductivity* [21]. It is well-known that science and scientific research seldom forgives or overlooks desecration. Noticing his idol-destroying publications, superconductivity conference organizers refrained from inviting *Hirsch*, colleagues did not seek collaborations with him, the number of sponsorships and fellowships diminished, widely read journals refused to publish his manuscripts.

I cannot exclude the presumption, that *Hirsch* was motivated by the frustration developed under the influence of the incidents mentioned when he created his index. This seems to be proven by the fact that *Hirsch* described his windmill struggle in a complaining paper entitled *BCS Theory of Superconductivity: the World's Largest Madoff Scheme?*

Following the previous facts, it may be worth briefly mentioning the *BCS-theory of superconductivity* criticized by *Hirsch*. *John Bardeen, Leon Cooper*, and *John Robert Schriffer* published their theory in 1957 and were awarded the Nobel-prize for physics in 1972. *Bardeen* was earlier awarded the Nobel-prize for the transistor-theory. Really no wonder that confronting the results of such authorities may be regarded as a professional suicide for *Hirsch*.

Of course, the foregoing does not mean that *Hirsch* could not publish his research results on the above and other topics. He had the possibility to publish, and his papers have been cited mainly by physicists, proving that they accepted some of his views. Frustrating for him was the fact that widely read journals, as *Nature* or *Science* were not willing to publish his manuscripts on superconductivity. I would like also to mention an interview *Hirsch* gave to *Vicky Hampton*, a scientific journalist. The interview was published in *Research Trends (Scopus)* with the title *Jorge Hirsch: The man behind the metric* in 2009 [22] and it is also available on the internet. I selected and cited below some questions raised and answers given during that conversation.

Research Trends (RT): *What triggered your interest in bibliometrics?*[***]

Professor Jorge Hirsch (JH): *There were two main reasons: I had trouble getting manuscripts accepted in journals with the highest Impact Factors because of the controversial nature of my research. A criterion often used in evaluating research achievement was to count papers published in high Impact-Factor journals; I wanted to provide an alternative criterion.*

RT: *Did you foresee the influence that the h-index would have on academia?*

JH: *I had not worked in bibliometrics before and was not totally familiar with the literature on the subject. I had recently read an article on bibliometrics by S. Redner [23] in Physics Today (June 2005) that I found very interesting, and it made me realize how important people find these issues. But I had no idea how my paper would be received, nor whether it would be publishable in a scientific journal. I have some concern, however, that the h-index may sometimes be misused by over-relying on it, although I don't know of any specific instances.*

RT: *Do you intend to publish further work in bibliometrics?*

JH: *Yes. Although it is not the main focus of my research at present, I would like to understand the issues better and contribute to the subject.*

Hirsch's publication activity in physics

According to *Google Scholar (SCOPUS*) from 1976 to 2019 database Hirsch published 333 scientific papers and book chapters. Four were on *scientometrics* - already mentioned above - the other ones in journals on different levels of physics (e. g. *Physical Review, Physical Review Letters, Journal of Applied Physics, Physica, Journal of Superconductivity and Novel Magnetism, Europhysics Letters, Physica Scripta*). Two of the four papers on *scientometrics* were published in *PNAS*, the other two in the journal *Scientometrics*. Total citations referring to the above-mentioned papers are 28884 according to *Google Scholar* in 2019. Hirsch's *h-index* in 2020 was 64.

[***]*Professor Hirsch used the more or less synonym expression bibliometrics instead of scientometrics*

As mentioned already and shown in the list above, *Hirsch's* manuscripts were not accepted in *Nature* and *Science*.

Planned promotion of Jorge Eduardo Hirsch for 2018

Hirsch served as a professor at the Department of Physics at University of California (San Diego) since 1987. The management of the department considered in 2017 to raise him to a rank of Professor Above Scale (Distinguished Professor). The management asked several experts in scientometrics and physics of superconductivity for assessment and recommendation. Among them the Editor-in-Chief of *Scientometrics* who received a letter of invitation (Figure 2) on 31 August 2017, presumably at the same time with other experts. As it appears from this letter, the full professor rank is divided into nine levels at the *University of California (San Diego)*, and above all takes place a tenth, highest level, the *Above Scale (Distinguished Professor)* rank. The conditions to be fulfilled by the nominee can be read in the letter of Figure 2. Of course, as the Editor-in-Chief of *Scientometrics* I complied with the request and according to my professional conviction from the view of *scientometrics*, I have warmly supported the promotion mentioned.

Epilogue

Few scientific researchers are living in the countries of the developed world, who never heard about the Hirsch-index. Several researchers have cited the index in their papers - as we indicated by numbers in the preceding, wrote about it rough and smooth, condemning and/or pointing out its improving circumstances and possible usefulness. Although as Hirsch itself outlined, he created his index explicitly for the assessment, measurement of the research activity of individuals. Several other applications have been possible, mainly in the sciences [13]. We have neither the space nor the opportunity to address these topics. Briefly, we would like to draw the attention to a particularly useful and comprehensive application of the Hirsch-index related to the classification of scientific topics and compounds in chemistry [24] and another publication on the ranking scientific journals in chemistry using the *Hirsch-index*, as well [25].

Finally, the chronicler should answer two questions. On the one hand, what is Hirsch dealing with nowadays, on the other hand, whether was he promoted in 2018? The answer to the first question is that he continues his research as before. In 2019 he published 5 papers in physics, [26-30] and as mentioned in the introduction, one in scientometrics [7].

To clarify the second question, I turned to *Hirsch* by a letter in which I revived our contact in 2005 – mentioned at the beginning of this chronicle. The answer arrived by return of mail (Figure 3). As *Hirsch* describes there, his promotion was unfortunately **"***rejected despite yours and many other excellent assessments, on the grounds that the University did not consider my contribution in research and service to be significant enough*."

Tárgy: Letter of Recommendation for Prof. Jorge Hirsch
Dátum: 31.08.2017 22:46
Feladó: Joan T Grohman
Címzett: Tibor Braun

August 31, 2017
Professor Tibor Braun
Eotvos University

Dear Professor Braun:

The Department of Physics at the University of California, San Diego, is considering Dr. Jorge E. Hirsch for advancement to Professor, Above Scale (Distinguished Professor), effective 7/1/18.

For such actions, the University of California requires letters of evaluation from experts in the field. I write to ask if you could assist us by providing a frank assessment of Dr. Hirsch's research or creative activity and professional standing, and your opinion as to whether these accomplishments warrant such advancement at this time.

The University of California divides the full Professor rank into nine steps. Beyond these steps is the Above Scale (Distinguished Professor) designation, which is reserved for scholars and teachers of the highest distinction, whose work has been internationally recognized and acclaimed, and whose teaching performance and service are excellent.

It is my hope that you will be able to provide a critical evaluation of Dr. Hirsch's work over his entire career, as a detailed evaluation is more useful than a testimonial summary. To aid you, I am enclosing a copy of Dr. Hirsch's curriculum vitae. It would be most helpful if you would address:

- Dr. Hirsch's primary scholarly or creative contributions and their impact on the field
- How Dr. Hirsch's accomplishments compare to those of other scholars in the field at a similar level of seniority, both nationally and internationally
- The quality of the venues in which Dr. Hirsch's work has appeared
- Dr. Hirsch's independent productivity and creativity and/or role in co-authored work
- Whether Dr. Hirsch would qualify for such an advancement at your Institution

If you are able to comment on Dr. Hirsch's accomplishments as a teacher and mentor and/or service to the profession, this would also be very helpful.

Please include a statement commenting on your relationship with Dr. Hirsch, making sure to note if you have been a co-author, mentor or collaborator on a proposed research project within the past five years. This information should be included _below the signature block_, not in the body of your letter, to ensure that your identity remains confidential (please see confidentiality statement below).

In order for your comments to be considered, I ask that you respond no later than September 29, 2017. You may e-mail your letter to me at chair@physics.ucsd.edu. If you will not be able to respond, we would appreciate if you could let us know as soon as possible so that an alternative reviewer can be contacted.

I recognize that writing a detailed assessment represents a significant demand on your time. The University of California regards peer review as essential to maintaining the quality of its faculty, and we greatly appreciate your assistance.

Sincerely,

Benjamin Grinstein
Chair, Department of Physics

Figure 2. Invitation letter by the head of the Department of Physics at the University of California (San Diego)

Tárgy: Re: I am hoping on your respond
Dátum: 16.09.2019 11:06
Feladó: Jorge E. Hirsch
Címzett: Tibor Braun

Dear Professor Braun,

Thank you for writing. Yes we have had various fruitful exchanges over the years, even though I never had the opportunity to meet you I certainly appreciate your very important contributions to the field. In particular your excellent journal Scientometrics, to which I had the privilege to contribute twice.

I was not aware that you were asked to provide an assessment on my research in 2017. Unfortunately the nomination was declined, despite yours and many other excellent assessments, on the grounds that the University did not consider my contributions in research and service to be significant enough. In any event I certainly would like to thank you for your time and effort in providing this assessment.

Certainly I would be happy to help you in your current project to the extent possible, let me know how.

Best regards,
Jorge E. Hirsch

Figure 3. Reply letter by Jorge Eduardo Hirsch

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