

During the second half of the twentieth century, there was a significant increase in the number of scientific articles and periodicals published in different fields of knowledge. This growth was accompanied by the appearance of various parameters aiming to examine the quality of the articles and periodicals published. If during the 80s the number of articles published was an indication of productivity, during the 90s the number of citations for the articles indicated recognition of the researcher's work. The next step was the creation of indicators to rate the quality of these periodicals, and thus, the *Impact Factor* appeared.^{1,2} It is noteworthy that these are all merely indicators, although many Funding Agencies and Institutions of Higher Learning and Research have used them in examining researchers and post-graduate courses.

Now a new indicator has appeared: the *Scientific Impact of Nations*.³ King³ has analyzed articles, revisions and their respective citations published in the over 8000 periodicals in 36 languages indexed on the ISI Thompson database, for the period of 1993 to 2001, which represents the most significant material in science and engineering.³ This study has also taken into consideration the investment in research undertaken by the respective countries. As a result, a list was made up containing the thirty-one countries responsible for 1% or more of the most frequently cited papers for this period. This group of countries is responsible for over 98% of the most frequently cited articles in the world. On this list, Brazil is in 23rd place, with 288 articles among the most cited for this period.

The number of articles cited is then compared to what the author calls *wealth intensity*³ (gross national product divided by population). Once this comparison is made, Brazil now appears in the 26th place, ahead of Russia, China, Taiwan, India and Iran. Countries such as Russia, China and India, whose contributions in citations are greater than Brazil's, change positions when this indicator is used (*wealth intensity*). It is noteworthy that no other Latin American country is on these lists.

New indicators are always welcome, as long as they are interpreted merely as indicators! The recently created *Scientific Impact of Nations* brings us a whole new attraction as it creates conditions for the comparison of nations, be they first world or not. Many signs have been detected which demonstrate the growth of research in Brazil, as well as an improvement in the quality of these publications. Each year, there is an increase in the number of Brazilian periodicals indexed, as well as their respective

impact factors. Today, Brazil is responsible for 1.5% of the world's scientific production and approximately 10% of Brazilian publications within the country in indexed periodicals is in periodicals of superior quality.

Another study published recently in *Chemical and Engineering News*,⁴ corresponding to publications indexed during the period of 1998-2001, reveals that Brazil is one of the countries presenting greater growth on publications for the period: South Korea, 1,332%; Taiwan, 472%; China, 354%; Brazil, 308%; and Italy, 99%. These studies^{3,4} do not discriminate fields of knowledge, although Chemistry is one of the most outstanding. Whatever the considered indicators may be, the growth in Brazilian scientific production during the last decades has been expressive. Recent data evaluating the post-graduate Programs carried out by CAPES has shown the continuous growth in the field of Chemistry. In the period evaluated (2001-03), 6565 articles were published in indexed periodicals, both national (508) and international (5815), and 1329 Master's of Science and 890 Ph.D.'s were granted. These data, when compared with the two previous years (1998-2000) represents an increase of 37 % in articles published and of 18 and 41%, respectively in Master's and Ph.D.'s.

The evidence shows that, in the case of Brazil, synergism between the scientific community, Societies, and Federal as well as State Research Funding Agencies has allowed for a growth in science much beyond any financial investment realized. We believe that with the absorption of young Ph.D.'s into the academic and industrial areas, and with the increase in investment in science, technology and innovation, which, without harming the resources of the treasury, can be made viable with the availability of the Sectorial Funds, there will be scientific growth and, consequently, more social justice.

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References

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