

**Purity and resentment in newspapers:  
the arrival of modern mathematics in Brazil<sup>□</sup>**

**Rogério Monteiro de Siqueira**

**Abstract**

This paper discusses some articles published in the lay media by two influential Brazilian scientists: Manoel Amoroso Costa (1885-1928) and Newton Affonso Carneiro da Costa (1929- ). These articles show that the subjects typically addressed in studies of logic and philosophy of mathematic were similar to the European ones, however, from a very particular perspective. They were mainly made by engineers, and published in media not devoted to pure mathematics. Moreover, a large part of the public attentive to modern mathematics in Brazil was lay.

**Keywords**

History of science; Popularization of science; Brazil; 20<sup>th</sup> century; Manoel Amoroso Costa; Newton da Costa

**Pureza e ressentimento nos periódicos:  
a chegada da matemática moderna ao Brasil**

**Resumo**

Este artigo discute alguns artigos publicados na mídia leiga por dois influentes cientistas brasileiros: Manoel Amoros Costa (1885-1928) e Newton Affonso Carneiro da Costa (1929- ). Esses artigos mostram que os assuntos tipicamente abordados em estudos de lógica e de filosofia da matemática eram similares aos europeus, mas com alguns aspectos muito particulares. Foram realizados principalmente por engenheiros e publicados em periódicos não dedicados à matemática pura. Além do mais, uma grande do público interessado em matemática moderna era composta por leigos.

**Palavras-chave**

História da ciência; Divulgação da ciência; Brasil; Século XX; Manoel Amoroso Costa; Newton da Costa

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“It is a melancholic experience for a professional mathematician to find himself writing about mathematics. The function of a mathematician is to do something, to prove new theorems, to add to mathematics, and not to talk about what he or other mathematicians have done.”

G.H.Hardy, *A Mathematician's Apology*

## Introduction

Publishing in newspapers is a controversial topic for scientists. On the one hand, it is usually regarded as a minor activity among scholars. On the other, translation of technical terms for the sake of the general public not rarely leads to embarrassments, and such papers are often rated incorrect, imprecise or incomprehensible.

This general situation has a special nuance in modern mathematics, since precision in reasoning was one of the greatest causes of anxiety and the most frequent reasons for arguments among the mathematicians dealing with subjects such as set theory, algebraic structures, non-Euclidean geometries, logic paradoxes, and so on, at the beginning of the 20<sup>th</sup> century<sup>1</sup>. However, when they could have, naturally, been expected to meet serious problems in the process of popularization, in fact, subjects such as logic paradoxes, relativity, space-time and the philosophy of mathematics appeared quite frequently in Brazilian newspapers in the 1920s and 1950s.

This paper discusses some articles published by two influential Brazilian scientists: Manoel Amoroso Costa (1885-1928) and Newton Affonso Carneiro da Costa (1929-). The former was one of the few Brazilian specialists in relativity theory in 1920s, whereas the latter is widely known for his fundamental contributions to paraconsistent logic. Some similarities in discourse led to propose the present analysis. Indeed, some hints seem to suggest that Newton da Costa, writing in the 1950s, was significantly influenced by Amoroso Costa; furthermore, he published a kind of tribute to him entitled “Amoroso Costa and the Artistic Value of Science” in the newspaper *Estado do Paraná*.<sup>2</sup> On the other hand, the three decades separating them also left their mark, and this is an aspect that must be emphasized.

The rise of pure mathematics and of studies on the foundations of mathematics belongs to a wider cultural movement in science at the turn of the 19<sup>th</sup> century known as “modernism”.<sup>3</sup> Although its existence seems undeniable, there is still no consensus among scholars regarding its characteristics and contents.<sup>4</sup> The uses, functions or meanings that modernism had achieved, in distinct cultural contexts, transformed the search for a wide-scoped analytic approach in a complex and, perhaps, utopian task. This paper also attempts at discussing some “national” peculiarities of modernism in exact sciences.

<sup>1</sup> Jeremy Gray, “Anxiety and Abstraction in Nineteenth-Century Mathematics”, *Science in Context* 17 (2004): 23-47.

<sup>2</sup> Newton A. C. Costa, “Amoroso Costa e o Valor Artístico das Ciências”, *O Estado do Paraná*, Curitiba, April 20 1952. FNAC, H, CX 200, 12, 212. Acervo Newton da Costa / Arquivos Históricos em História da Ciência/CLE-UNICAMP.

<sup>3</sup> Jeremy Gray, *Plato's Ghost: The Modernist Transformation of Mathematics* (Princeton: Princeton University Press, 2008).

<sup>4</sup> Leo Corry, "How Useful is the Term 'Modernism' for Understanding the History of Early Twentieth-Century Mathematics?", in *Modernism in the Sciences, ca. 1900-1940*, ed. Moritz Epple and Falk Mueller (Berlin: Akademie Verlag, forthcoming).

### Engineers, mathematicians, physicists or philosophers?

The trail of the newspaper articles of Manuel Amoroso Costa is easy to trace. They were compiled in *The Fundamental Ideas of Mathematics and Other Essays*,<sup>5</sup> a selection of writings that was published in 1971. This book contains some conferences, articles in newspapers, and the book *The Fundamental Ideas of Mathematics*. The focus of the editors was to present a “philosophical Amoroso”; the texts he had published in engineering journals had no part on this collection. This is explicitly stated in the foreword and introduction: Miguel Reale, then president of the Brazilian Institute of Philosophy (IBF), explains that the book belongs to a series supervised by the IBF devoted to re-editing writings by some Brazilian authors (philosophers, as it can be inferred).

Although some consider Amoroso Costa to have been a mathematical physicist<sup>6</sup>, this qualification seems inappropriate, or at least incomplete, when we examine his works on mathematics, his activities as a railway engineer and his philosophical articles in newspapers. This historiographical approach to the Brazilian mathematical sciences, which highlights specific characteristics of characters, while leaving aside the universality of their actions, firstly appears with the seminal work of Francisco Castro<sup>7</sup>, in the 1950s, prevailing with few variations in more recent studies<sup>8</sup>.

From these studies it is possible infer that the professionalization of the mathematical sciences - which began in the 1930s with the foundations of the University of São Paulo and the University of Brazil - consolidated a process of specialization of the mathematical knowledge in such a way that mathematical precision and the studies on theoretical questions were considered intrinsic qualities of the mathematicians, being this an important distinction between their and others careers in the exact sciences. Following this social distinction, Castro and others historians of the mathematical sciences conceived of their protagonists as specialists, when, as a fact, they were not.

Not surprisingly, Newton da Costa, in “Amoroso Costa and the artistic value of sciences”, rated Manuel Amoroso Costa as one of the best four Brazilian mathematicians [the other three were Theodoro Ramos (1895-1935), Otto de Alencar (1874-1912) and Gomes Souza (1829-1864)]. These four mathematicians are largely responsible not only for modernizing Brazilian mathematics, investigating original questions and implementing a modern language, but they also fought to achieve an autonomous space for research in mathematics.

Amoroso’s appraisal of the ongoing lack of undergraduate courses in mathematical and physical sciences is emblematic of the former situation: “[...] our soil is still inadequate for the cultivation of this supreme flower of the spirit, pure, contemplative and neutral science”. After this metaphoric description, he ironically adds the following: “[...] pure science is the naive hobby of a half-dozen maniacs, lost in imaginary worlds, searching for fancy geometries or phenomena that

<sup>5</sup> Manuel Amoroso Costa, *As Idéias Fundamentais da Matemática e Outros Ensaios*. (São Paulo: Grijaldo; Edusp, 1971).

<sup>6</sup> Michel Paty, “Les Débuts de la Physique Mathématique et Théorique au Brésil et l’Influence de la Tradition Française”, in *Science and Empire: Historical Studies about Scientific Development and European Expansion*, ed. P. Petitjean, C. Jami & A.-M. Moulin (Dordrecht: Kluwer, 1992), 173-91; Jean Eisenstaedt & Júlio C. Fabris, “Amoroso Costa e o Primeiro Livro Brasileiro sobre a Relatividade Geral”, *Revista Brasileira de Ensino de Física* 26 (2004): 185-92.

<sup>7</sup> Francisco Mendes de Oliveira Castro, “A Matemática no Brasil”, in *As Ciências no Brasil*, ed F. Azevedo, (São Paulo: Melhoramentos, 1955), vol. 1, 41-77.

<sup>8</sup> See, for example, Chaim S. Höning & Elza F. Gomide, “Ciências Matemáticas” in *História das Ciências no Brasil*, ed. M. Guimarães & S. Motoyama (São Paulo: EDUSP & EPU, 1979), vol. 1, 35-60; Circe Mary da Silva, “Politécnicos ou Matemáticos”, *História, Ciências, Saúde - Manguinhos*, 13 (2006): 891-908; Clóvis Pereira da Silva, “Manuel Amoroso Costa: O Continuador da Obra Matemática de Otto de Alencar Silva”, *LLULL*, 23 (2000):91-101.

<sup>9</sup> Newton da Costa, “Amoroso Costa e o Valor Artístico das Ciências”.

will be used [only] in the 40<sup>th</sup> century, it is superfluous par excellence. People engaged with this science are those who enjoy, have money and time.”<sup>10</sup>

Although Amoroso Costa and Newton da Costa both held degrees in engineering and mathematics, the subjects of their work are not easily comparable or restricted to engineering. Whereas Amoroso wrote about mathematics, physics, philosophy of science, and engineering, Da Costa devoted himself to Kantian philosophy, theory of language and propositional logic.

### Pure science for the lay public

Amoroso wrote almost all his newspapers' articles between two long seasons in Paris. The first one lasted from May 1920 to December 1921, and the second, from August 1923 to February 1925. In such occasions, he attended lectures by Abel Ray (1873-1940) on philosophy of science, Leon Brunschvicg (1869-1944) on theory of knowledge, and Marie Henri Andoyer (1862-1929) on the theory of lunar motion. It is highly probable that some of the topics addressed in his articles were influenced by this experience (Table 1):

Table 1. Newspaper articles by Amoroso Costa

Date	Title	Newspaper
Nov 12 1919	A Teoria de Einstein (Einstein's Theory)	<i>O Jornal</i>
March 19 1922/ Apr 2 1922	À Margem da Teoria de Einstein (Outside Einstein's Theory)	<i>O Jornal</i>
Sept 8 1922	Emile Borel	<i>O Jornal</i>
Oct 22 1922	Bergson e a Relatividade (Bergson and Relativity)	<i>O Jornal</i>
Nov 11 22	O Problema da Ciência (The Problem of Science)	<i>O Jornal</i>
Jan 28 1923/Feb 25 1923	As Duas Imensidades (Two Immensities)	<i>O Jornal</i>
May 5 1923	Pela Ciência Pura (Pro Pure Science)	<i>O Jornal</i>
June 20 1923	Pascal Geômetra (Pascal, Geometrician)	<i>O Jornal</i>
Sept 23 1928	Uma Obra de Cultura (A Cultural Work)	<i>O Jornal</i>
Dec 16 1928	O Poeta e a Ciência (A Poet and Science) [posthumous]	<i>O Imparcial</i>

Besides some reviews on the life and work of several French thinkers – Émile Borel, Léon Brunschvicg, Henri Bergson and Blaise Pascal- and the presentation of simple aspects of the theory of relativity or atomistic, the articles of Amoroso Costa obstinately discuss the limits of science and its relation to reality.

According to him, scientific theory and reality are two inseparable poles that contribute to improve human knowledge. Criticizing the positivistic ideal of a complete science, as well as some lack of interest of Brazilian intellectuals on scientific research, Amoroso argues that reality will never be able to be fully understood. For this reason, scientific theories do not stagnate, but rather evolve without any limits whatsoever.

On the other hand, he believes that abstract theories can lead us to unusual discoveries about reality. For him, relativity theory, non-Euclidean geometries, multi-dimensions or Peano's curves are unintuitive, but modern subjects that have founding applications. Thus, such subjects must be presented to the lay public, which might then become a partisan of pure science.

<sup>10</sup> Manuel Amoroso Costa, “Pela Ciência Pura”, Amoroso Costa, 150-52, on 151.

Moreover, Amoroso was an influential member of two organizations that propagated new ideas on research and teaching of science, the Brazilian Academy of Science (ABC) and the Brazilian Academy of Education (ABE). The campaign launched by these academies included the foundation of universities, where both teaching and research entered the job description of professors.<sup>11</sup>

On another front, this movement was publicized through the press and in the courses aiming at the lay, sponsored in many cases by the French-Brazilian Institute for Higher Culture (Instituto Franco-Brasileiro de Alta Cultura).<sup>12</sup>

Coming back to Amoroso, he also contributed to this goal through a series of lectures on mathematics destined to the lay. Among these lectures, included in *The Fundamental Ideas of Mathematics*, there are some of the most representative subjects of modern mathematics, as indicated by their titles: “Symbolic Logic and Mathematics”, “Transfinite Numbers”, “The Notion of Group”, “Non-Euclidean and Non-Archimedean Geometries” and “The Notion of Dimension”.

Reviewing the impact of these conferences, Amoroso commented:

“Their aim was not only to publish that knowledge due to its utility or eccentricity. Its main purpose was to awaken interest in studies of any order and to create adequate conditions for these studies. We do not only assert the need to solve our problems with the universities: the success of our courses means an empiric and actual demonstration of the need to create a university worthy of this name.”<sup>13</sup>

### Between philosophy and mathematics

It is important to keep in mind that both Amoroso Costa and Da Costa had non-formal studies in philosophy. As a fact, only lawyers and the religious had formal access to undergraduate studies of this discipline until the 1930s.<sup>14</sup> Even twenty years after, in 1952, the “First Brazilian Philosophy Week” still reflected the prevalence of lawyers and Catholics in the community of Brazilian philosophers, as announced in the magazine *Revista do Globo* (Figure 1).

<sup>11</sup> Jorge A. Carreta, “Os Intelectuais e a Idéia de Universidade no Brasil dos Anos 20” (doctoral dissertation, Unicamp, 1999).

<sup>12</sup> In this regard, it must be observed that this cultural movement had strong connections with the imperialistic interests of France in Latin America. Marie Curie, Paul Rivet and Paul Langevin, for instance, gave lectures in Brazil sponsored by the Institute. See Hugo Supo, “A Política Cultural da França no Brasil entre 1920 e 1940: O Direito e o Averso das Missões Universitárias”, *Revista de História* 142/143 (2000): 309-45; Patrick Petitjean, “Ciências, Impérios, Relações Científicas Franco-brasileiras”, in *A Ciência nas Relações Brasil-França (1850-1950)*, ed. A.I. Hamburger, M.A.M. Dantes, M. Paty & P. Petitjean (São Paulo: EDUSP, 1986), 25-39.

<sup>13</sup> Apud L. Massarani, “A Divulgação Científica no Rio de Janeiro: Algumas Reflexões sobre a Década de 20” (doctoral dissertation, UFRJ/IBICT-ECO, 1998).

<sup>14</sup> I am deeply indebted to Daniela Ferreira, who in recent work dealt with the professionalization of philosophy in Brazil and explained to me many important facts about it; see “Conversão e Reconversão: A Circulação Internacional dos Filósofos de Origem Católica”(doctoral dissertation, Unicamp, 2007).



Figure 1: First Brazilian Philosophy Week, 1952. Newton da Costa is the second and Miguel Reale the fifth from the right (Acervo Newton da Costa / Arquivos Históricos em História da Ciência / CLE-UNICAMP).

The main themes of this congress were Thomism, Culturalism and Existentialism. Newton da Costa, participating with a lecture entitled “The Circle of Vienna and Philosophy”, was presented as a neopositivist.<sup>15</sup> What an engineer discussing philosophy of mathematics had to do among lawyers and clerics?

Newton da Costa was born in 1929, in Curitiba, at the south of Brazil. He had strong family roots in the scholarly world: his mother and his aunt had been teachers of French and English literature, and his uncle and grandfather had been professors of medicine at the University of Paraná, where also Da Costa taught until the end of the 1960s.

By age 20,<sup>16</sup> under the influence of his mother, he had already read many works by Bertrand Russell, and through his uncle, Milton Carneiro, he was introduced to the work of Laird, Quine, Popper, Carnap, Enriques and Poincaré. From this familiar heritage he received a background sufficient to write on philosophy and logic at the beginning of his career in the 50s, despite the lack of any formal studies in this area (Table 2).

<sup>15</sup>Newton da Costa, “O Círculo de Viena e a Filosofia”, Tapejara (Ponta Grossa, PR), January 14 1954,

<sup>16</sup>Testimony of Newton da Costa to Projeto História Oral, CLE-UNICAMP, 1991.

[http://www.cle.unicamp.br/arquivoshistoricos/?destino=av\\_depoimentos\\_historal.html](http://www.cle.unicamp.br/arquivoshistoricos/?destino=av_depoimentos_historal.html)



Table 2. Articles in the lay press by Newton da Costa (1949-1954)

Date	Title	Newspaper
June 10 1949	A Matemática Está Voltando ao Estado Metafísico (Mathematics is returning to the metaphysical stage)	<i>Gazeta do Povo</i>
Sept 16 1949	A Crise Atual da Matemática (The current crisis in mathematics)	<i>Gazeta do Povo</i>
Apr 6 1952	A Matemática de Bertrand Russell (The mathematics of Bertrand Russell)	<i>Estado do Paraná</i>
Apr 20 1952	Amoroso Costa e o Valor Artístico das Ciências (Amoroso Costa and the artistic value of science)	<i>Estado do Paraná</i>
July 13 1952	A Evolução da Lógica (The evolution of logic)	<i>Estado do Paraná</i>
July 20 1952	A Evolução da Lógica II (The evolution of logic II)	<i>Estado do Paraná</i>
Aug 10 1952	A Moderna Teoria da Linguagem (The modern theory of language)	<i>Estado do Paraná</i>
Sept 17 1952	A Filosofia Inglesa e a Conferência do Prof. Tidman do I.B.F (English philosophy and the conference by prof. Tidman from IBF)	<i>Estado do Paraná</i>
Jan 14 1954	O Círculo de Viena e a Filosofia (The Circle of Vienna and philosophy)	<i>Tapejara</i>

At the end of 1940s, when Newton da Costa began his studies of civil engineering, there were organized undergraduate courses on mathematics, physics and philosophy in some State capitals, partly in response to the movement organized by ABE and ABC, for which Amoroso Costa had worked<sup>17</sup>. However, these career-options were not too much appealing to youths by comparison to engineering or law. At that time it was not rare to find engineers applying for positions and publishing in mathematics. Thus, it can be said that the boundaries of mathematics and philosophy were quite permeable for the non professional.

Although, in the 1960s Da Costa became known by his contributions to logic, such intellectual project was far from being consolidated in the 1950s. As a fact, he does not show true confidence in the project of the Circle of Vienna:

“We cannot present in a detailed manner arguments for the famous Viennese thesis stating that philosophy is only syntax. However, there is no doubt that this thesis is very radical and difficult to defend. Even Carnap changed [his view] in later years in order to avoid too harsh constraints in philosophical research”<sup>18</sup>.

On the other hand, he seemed excited with the ideas of Russell, whose works were available in Portuguese since the 1940s. Engaged in the popularization of science, but mainly with the ideal of pure science, an inclination very akin to Amoroso Costa’s and Russell’s, he argues that “nothing is more perfect to show the delay of the beliefs of some suburban mathematicians”<sup>19</sup> than showing the conception of pure mathematics of Bertrand Russell. After some digressions about

<sup>17</sup> Simon Schwartzman, *A Space for Science: The Development of the Scientific Community in Brazil* (University park [PA]: The Pennsylvania State University Press, 1991).

<sup>18</sup> Newton da Costa, “O Círculo de Viena e a Filosofia”.

<sup>19</sup> Newton da Costa, “A Matemática de Bertrand Russell”.

non-Euclidean geometries, Da Costa quotes a famous citation from *Mathematics and Metaphysicians*: “mathematics may be defined as the subject in which we never know what we are talking about, nor whether what we are saying is true”<sup>20</sup>.

The articles published in newspapers in 1952 coincided with Da Costa’s graduation from engineering school and his contribution to the meeting of the IBF. Three years later he also graduated in mathematics. Oscillating between mathematics and philosophy, but mostly criticizing those who in the latter “obdurately employ a medieval scholastic verbiage” and in the former, “do not take into account the logic of deductive techniques, but methodologically defend fossilized theories”<sup>21</sup>, Da Costa outlined in 1958 his first ideas on inconsistency in a 3-page short communication published in a mathematics journal.<sup>22</sup> Propositional calculus for inconsistency would only appear in the 1960s, after exchange with French logician Marcel Guillaume.<sup>23</sup> In *Introdução aos Fundamentos da Matemática* (Introduction to the Foundations of Mathematics),<sup>24</sup> published in 1962, he proposed a *scientific* philosophy of mathematics, restricting his concerns to philosophical problems susceptible of being translated into scientific terms: “This work is concerned with the foundations of mathematics, or in other words, we try to deal only with problems that are susceptible of being considered in scientific and positive terms. Thus, perhaps, it would be better to say that we will make scientific philosophy of mathematics”<sup>25</sup>.

### Conclusions

Was there a mathematical Modernism in Brazil?<sup>26</sup> This paper is far from answering this question. By comparison to the same period (1890-1930), when this movement developed in Europe, in some regards it is difficult to identify it in Brazil. Although modernistic themes can be found in the work of Brazilian scholars, as, e.g. Amoroso Costa in the 1920s, their presence seems sparse and perhaps also marginal. This latter aspect is reinforced by the effort of popularization of “pure, contemplative and neutral science” among the lay.

This alleged lack of synchronicity between science in Brazil and Europe is usually regarded as the consequence of a belated influence of positivism in Brazil.<sup>27</sup> However, beyond this hypothesis, I argue here that the use of set theory in mathematics or the tendency of sciences to discuss philosophy of science (especially in a Kantian framework), served as a social distinctive mark from the older intellectuals – but for the positivists – and to establish a new scientific tradition in mathematics and physics. Naturally, this hypothesis still requires further elaboration.

In this regard, three phenomena seem particularly significant: the reception of foreign earlier divergences; the onset of the professionalization of mathematics and philosophy in Brazil;

<sup>20</sup> Ibid.

<sup>21</sup> Newton da Costa, “Evolução da Lógica I”, “Evolução da Lógica II”.

<sup>22</sup> Newton da Costa, “Nota sobre o Conceito de Contradição”, *Anuário da Sociedade Paranaense de Matemática*, 2a Série, 1 (1958): 6-8.

<sup>23</sup> Marcel Guillaume, “Da Costa 1964 Logical Seminar: Revisited Memories”, *CLE e-Prints*, 4, no 2 (2004) :1-52.

<sup>24</sup> Newton da Costa, *Introdução aos Fundamentos da Matemática* (São Paulo: Globo, 1962).

<sup>25</sup> “A obra trata de fundamentos da matemática ou, noutras palavras, de filosofia da matemática. Porém, na verdade, procuramos considerar apenas problemas suscetíveis de serem equacionados em termos mais ou menos científicos e positivos. Assim, talvez fosse melhor dizer que faremos filosofia científica da matemática.”, Ibid., 3.

<sup>26</sup> Jeremy Gray defines Modernism as “an autonomous body of ideas, having little or no outward reference, placing considerable emphasis on formal aspects of the work and maintaining a complicated - indeed, anxious - rather than a naive relationship with the day-to-day world, which is the de facto view of a coherent group of people, such as a professional or discipline-based group that has a high sense of seriousness and value of what it is trying to achieve”, See: Gray, 2008, p.1.

<sup>27</sup> Paty, 5.



and the rise of new Brazilian experts within the scientific community.

From a sociological point of view, it is desirable to understand the actions of agents and their purposes. Therefore, to admit as given the discourses for “pure”, “neutral” science leads to some problems. According to Bourdieu, for instance, disinterested acts are only possible when habits predisposing to disinterest and environments rewarding such acts meet. This is a perspective that still needs to be researched in the case of mathematics in Brazil, where it seems that pure mathematics and mathematicians were indeed both possible and rewarded at the modern scientific community after 1930s.

### **Rogério Monteiro de Siqueira**

Social History of Science; Sociology of Knowledge

Professor, Escola de Artes, Ciências e Humanidades, Univeristy of São Paulo (USP), Brazil

e-mail: rogerms@usp.br