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ON THE DEVELOPMENT OF LOGIC IN BRAZIL I: THE EARLY LOGIC STUDIES AND THE PATH TO CONTEMPORARY LOGIC

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Abstract

This article presents the first part of a historical overview of the development of logic in Brazil, and describes the development of contemporary logic in the county with an emphasis on its socio-institutional and interdisciplinary aspects. After a brief introduction recounting the development of logic within the Luso-Brazilian academic milieu, we mention the work of the first Brazilian authors and groups of scholars who may be considered logicians. Special emphasis is given to the emergence of original research in logic in Brazil with the pioneering work of Newton Carneiro Affonso da Costa and the creation of paraconsistent logic. Also highlighted are the establishment of the Centre for Logic, Epistemology and History of Science (CLE) at the State University of Campinas (Unicamp), the creation of the Brazilian Logic Society (SBL), the realization of the Brazilian Logic Conferences (EBLs), and Brazilian participation in the Latin American Symposia on Mathematical Logic (SLALMs).
The second part of this historical overview will appear in the next number of this journal, concerning the recent initiatives in Brazil related to logic, and the Brazilian research groups dedicated to logic.
Both papers do not present or discuss the content of the research, or the specific results, of logicians or groups of researchers dedicated to logic in the country.

Keywords: The development of logic in Brazil, First part, Early logic studies, Contemporary logic, Socio-institutional and interdisciplinary aspects, First Brazilian authors and groups, Paraconsistent logic, Centre for Logic, Epistemology and the History of Science (CLE), Brazilian Logic Society (SBL), Brazilian Logic Conferences (EBL), Latin American Symposia on Mathematical Logic (SLALM).

[SOBRE O DESENVOLVIMENTO DA LÓGICA NO BRASIL I: OS PRIMEIROS ESTUDOS EM LÓGICA, E O ECLODIR DA LÓGICA CONTEMPORÂNEA]

Resumo

Este artigo apresenta a primeira parte de um panorama histórico sobre o desenvolvimento da lógica no Brasil, que tem por objetivo descrever o desenvolvimento da lógica contemporânea no país, com ênfase no aspecto sócio-institucional e na interdisciplinaridade.
Após uma sucinta introdução sobre o desenvolvimento da lógica no cenário acadêmico luso-brasileiro, é mencionado o trabalho precursor dos primeiros autores e grupos brasileiros que podem ser considerados lógicos. É dada ênfase especial ao eclodir da pesquisa original em lógica no Brasil, com o trabalho pioneiro de Newton Carneiro Affonso da Costa e a criação da lógica paraconsistente. São também destacadas a implantação do Centro de Lógica, Epistemologia e História da Ciência (CLE) da Universidade Estadual de Campinas (Unicamp), a criação da Sociedade Brasileira de Lógica (SBL), a realização dos Encontros Brasileiros de Lógica (EBLs), e a participação brasileira nos Simpósios Latinoamericanos de Lógica Matemática (SLALMs).
A segunda parte deste panorama histórico, que aparecerá no próximo número desta revista, versa sobre iniciativas recentes no Brasil relativas a lógica, e os grupos brasileiros de pesquisa dedicados à lógica.
Os dois artigos não pretendem apresentar, ou discutir, a produção e resultados específicos de pesquisa dos lógicos ou dos centros de pesquisa dedicados à lógica no País.

Palavras-chave: História da lógica no Brasil, Primeira Parte, Primeiros estudos de lógica, Lógica contemporânea, Aspectos interdisciplinares e sócio-institucionais, Autores e grupos brasileiros, Lógica paraconsistente, Centro de Lógica, Epistemologia e História da Ciência (CLE), Sociedade Brasileira de Lógica (SBL), Encontros Brasileiros de Lógica (EBLs), Simpósios Latino-americanos de Lógica Matemática (SLALMs).

1. On the early logic studies

Logic was given a privileged place in the Luso-Brazilian academic milieu.[1] The discipline was introduced in Brazil through the courses in philosophy taught by the Jesuits and other religious orders in their schools, following the approach of the College of Arts in

[1] See MIRANDA BARBOSA, cited in (FONSECA, 1964, p. XIV).

Lisbon.[2] The diffusion of renewed scholasticism was wide, but there is no evidence that this was the only influence at work. Although there is reason to believe that the Jesuits taught logic in accord with the ideas of this movement, they also worked with other approaches to logic such as Llullism[3], a perspective in which a project for the mathematization of thought appears.[4]

The Jesuit influence on colonial education was vast and hegemonic. Until the first half of the 18th century, the predominantly scholastic orientation toward the teaching of logic was unopposed in Brazil. In fact, it was only in 1759, when the Marquis of Pombal (Sebastião José de Carvalho e Melo, 1699-1782) initiated academic reforms in Portugal and its domains, that the typical scholastic logic of the previous centuries would be officially passed over in favor of an eclectic logic of a modern character. This new conception of logic favored the creation of principles for the correct use of all operations of the mind involved in cognition – ideas, judgment, and reasoning.[5] Thus we find in the Portugal of the 18th century decisive clues for understanding the type of logic practiced in Brazil in the transition from 18th to the 19th centuries. In this historical context the implantation of a pragmatist concept of logic was defended, in service of the Enlightenment outlook, as being capable of reforming minds and making Portugal equal to the great nations of the day.[6]

In the 18th century, Portuguese universities provided education to students at all levels, including pre-university studies, a scenario in which logic stood out because only those who passed the proficiency examination in this discipline were admitted to the University of Coimbra.[7] In this context, eclectic logic or 'good logic' did not completely supersede the scholastic tradition in Portugal and Brazil. It seems rather that the two visions of logic were combined, and that they coexisted in the period following the Pombaline reforms. One can even say that not only did this occur, but also that a truly syncretic logic was attained, given the theoretical freedom that allowed for the merging in a somewhat uncritical manner of elements of the forms of logic in vogue at the time.

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[2] See (LEITE, 1938) and (CAMPOS, 1964, p. 43).

[3] Ramon Llull (1232-1315) inaugurated the use of geometric diagrams for the purpose of discovering non-mathematical truths, being the first in this field to use a mechanical device – a logic machine. Llull's method is based on the idea that there is, in any branch of knowledge, a small number of basic principles or categories that must be taken as true and unquestionable. Therefore, on this view, by combining all the possibilities of these categories one should be able to explore all knowledge accessible to our finite minds. The Llullian perspective on logic was widely accepted during the Renaissance and in the 17th century. According to (GARDNER, 1958, p. 59), of particular interest to contemporary logicians is Llull's practice of condensing certain words and expressions and reducing them to a quasi-algebraic form. Llull's ideas about logic had a great impact in the Iberian Peninsula, as "Schools and disciples grew so rapidly that in Spain the Llullians became as numerous as the Thomists. Llull also taught on certain occasions at the distinguished University of Paris – a sign of honor for a man who had no academic degree of any kind." Notably, "of all aspects of Llullism, the most important in the 17th century, certainly at least for logic, is what is united to the *mathesis universalis* and to the mathematization of logic on the basis of combinatorics – the Jesuit Izquierdo Sebastián being a distinguished representative of this approach and a forerunner of Leibniz..." (MUÑOZ DELGADO, 1982, p. 289). This conception of logic would have been one of the influences on young Leibniz in the conception of his *ars combinatoria*. See (GARDNER, 1958, Ch. 1).

[4] See (MUÑOZ DELGADO, 1982, p. 280-289).

[5] See (BUICKEROOD, 1985, p. 159).

[6] See (MAXWELL, 1995, p. 10,101) and (GOMES, 2002, p. 36-39).

[7] See (UNIVERSIDADE DE COIMBRA, 1591, p. 121 recto, 124 recto/verso; 1772) and (GOMES, 2002, p. 25-31).

The reforms took effect in the form of the adoption of new logic manuals. The pioneer of the reform of logic in Portugal was (Manual Azevedo Fortes, 1660–1749), the author of *Lógica Racional, Geométrica e Analítica* published in 1744.[8] Two other texts were fundamental in the Pombaline reform of logic: the *Instituitiones logicae ad usum tironum scriptae* of Antônio Genovesi (Genuensis, 1712-1769)[9], and the *De Re Logica ad Usum Lusitanorum Adolescentium* of (Luis Antonio Vernei, 1713-1792)[10], both widely used in Brazil. The psychologistic elements in the logic of these authors, together with the eclecticism that characterizes the approach to logic taken by both writers, gave support to the philosophical eclecticism that emerged in Brazil in the first half of the 19th century.[11] This philosophical movement, under the form of spiritualism, later consolidated the development of the Romantic movement in philosophy in the country.[12]

Although eclecticism was a widespread cultural phenomenon in Brazil during the First and Second Empires (1822-1889), it varied in terms of the extent to which the different disseminators of logic assimilated its elements. Not rarely, this logical-methodological eclecticism induced severe incoherences and inconsistencies in the ideas elaborated by Brazilian scholars. The Franciscan friars Francisco de Monte Alverne and Antônio da Virgem Maria Itaparica well represent this stage in the history of logic in the country.[13] It should also be noted that the scholastic influence on logic in Brazil never ceased, whether under its own forms, or under the aegis of the neo-scholastic logic typical of 19th century.[14]

In the last quarter of the 19th century, the positivist influence imposed itself upon the understanding of logic in Brazil. Positivist logic denotes, in essence, the vision of logic championed by Auguste Comte in his *La Synthèse Subjective: ou système universel des conceptions propes a l'élat normal de l'humanité*[15], although it cannot be reduced to this entirely. The consequences of the adherence of many Brazilian intellectuals this obtuse vision of logic entailed an ephemeral change in the perspective on logic in the country, and induced mathematizing perspectives in the discipline. Paradoxically, however, it brought with it harmful effects that most certainly had a negative influence the development of logic in Brazil in 19th and 20th centuries. Positive logic *à la* Comte, appearing on the threshold of the full renovation of logic in its contemporary form, could not accompany the new developments. The Comtean conception of mathematics, likewise, was quite foreign to the revolution that occurred in the 19th century with the advent of algebraic structures. Comte looked upon this development as retrograde anarchy consecrated by academia, an environment into which he had never been welcomed.[16] In fact, Comte's beliefs about mathematics and logic are extremely simplificatory. As with the Pombaline reforms, in

[8] See (FORTES, 1744).
[9] See (GENUENSIS, 1786). This work is a simplified edition of another more systematic work by the same author, the *Elementorum Artis Logico-Criticae*. See (GENUENSIS, 1767).
[10] See (VERNEI, 1950). The first edition of this work is dated 1751.
[11] See (GOMES, 2002, p. 39-45).
[12] See (CRUZ COSTA, 1956, p. 83).
[13] See (GOMES, 2002, p. 111-155).
[14] See (GOMES, 2002, p. 159-201).
[15] See (COMTE, 1900).
[16] See (COMTE, 1900, p. 66).

which the teaching of logic from the formal point of view was impoverished, Comte's didactic advice in the *Synthèse* was enormously prejudicial to teaching and research on logic in Brazil.[17]

In Brazil, adherence to the positivist vision of logic played a crucial role. On the one hand, it was a rival to the Greco-scholastic forms of logic superficially taught in Brazilian schools and seminaries, pointing in a myopic fashion to the prospect of the mathematization of logic. On the other hand, it introduced prejudices which compromised research in mathematics and logic in the first decades of the 20th century. The healthiest occurrence of this period, it should be noted, was the contact with good logic texts, especially those of other authors of the positivist movement. These texts influenced the history of logic in Brazil during the transition from the 19th to the 20th centuries. The logic of John Stuart Mill (1806–1873) had many readers in Brazil, as shown by certain documents and by the examinations for the chair of logic at the Colégio Pedro II, held in May of 1909, at which appeared such distinguished figures of the Brazilian intelligentsia as Euclides da Cunha (1866–1909) and Raimundo de Farias Brito (1862–1917).[18] The same may be said about the influence of Alexander Bain (1818–1903) and Herbert Spencer (1820–1903), whose positivist approaches to logic are marked, however, by their peculiar conceptions of knowledge, man, and society.[19]

2. On the path to contemporary logic

In the first decades of the 20th century there was in Brazil a slow and increasing contact with contemporary logic, which intensified after the Second World War.

The first book written in Brazil which makes reference to mathematical logic was *As Ideias Fundamentais da Matemática* by Amoroso Costa, published in 1929.[20]

A decade later, there appeared in 1940 the first work entirely dedicated to the discipline, the *Elementos de Lógica Matemática* by Vicente Ferreira da Silva.[21] The author was a graduate of the law school in São Paulo, which had been recently added to the nascent Universidade de São Paulo (USP). Since 1933 he had been active in the local mathematics community, especially in his contacts with professor Octávio Monteiro de Carmargo and the Italian professors Giacomo Albanese and Luigi Fantapié, all three of whom were important figures in the initial nucleus of professors at the Mathematics

[17] See (COMTE, 1900, p. 68) and (GOMES, 2002, p. 210-231). Comte prescribes two years of twice weekly classes of encyclopedic instruction as adequate for learning the basic notions of logic, with astronomy included as well.

[18] See (GOMES, 2002, p. 301-318). The Colégio Pedro II in Rio de Janeiro was the most important secondary school in Brazil during the 19th century. Many of the country's political and intellectual elite were students or teachers at this institution.

[19] An ample study of this period in the history of logic in Brazil was carried out by Evandro L. Gomes in his Master's degree research, under the supervision of Newton Carneiro Affonso da Costa. In this study the author brings out many unknown aspects of the pre-university phase of logic in Brazil, making reference to numerous unpublished documents. See (GOMES, 2002).

[20] See (AMOROSO COSTA, 1929, 1981).

[21] See (DA SILVA, 1966, vol. II, p. 9-79).

Department of the Institute of Mathematics and Statistics that would later be founded at USP.[22] In his book, the author claims for logic a place as the basis of philosophical activity. This pioneering work correctly presents the fundamental concepts of propositional and predicate logic, devoting specific chapters to the treatment of the new doctrine of terms, the theory of atomic and molecular propositions, the propositional calculus, the notion of propositional function and its applications, the fundamentals of the calculus of classes, and the laws of deduction in first-order logic. He ends his exposition by analyzing the fundamental distinction in contemporary logical analysis between the semantic and the syntactic approaches, and outlining the distinction between logical validity and truth.[23]

Nevertheless, it would be reserved to the American logician Willard Van Orman Quine to inaugurate the contemporary phase of logic in Brazil, in a course taught from June to September 1942 at the Free School of Sociology and Politics of São Paulo.[24] Quine's visit contributed significantly to an increased interest in logic on the part of Brazilians, and this resulted two years later in the publication of Quine's course in Portuguese, under the title *O Sentido da Nova Lógica*.[25] Vicente Ferreira da Silva acted as Quine's assistant during the course and also assisted in the editing of the book.

Another important figure in this era was the French epistemologist Gilles-Gaston Granger, who taught at the Faculty of Philosophy, Letters, and Sciences at USP from 1947 to 1953.[26] By that time, the continuous and vigorous development of Brazilian logic was ready to begin.

2.1. The first Brazilian logicians

In the 1950s, there appeared the first Brazilian authors who can properly be regarded as logicians. In this and the following decade there existed a small and active group of scholars in the areas of logic and the foundations of mathematics, which later became known as the School of Curitiba. This group greatly benefited from the experience of João Remy Teixeira Freire, a professor from Portugal who resided in Curitiba at that time. Another important figure was Jayme Machado Cardoso, a specialist in the study of algebraic structures.[27]

Edson Farah (1915-2006) played a very important and central role in the development of logic in Brazil. Having as his thesis advisor Omar Catunda, he defended his doctoral thesis, *Sobre a Medida de Lebesgue*, in 1950, at USP. In 1954, he was approved as Full Professor of the Faculty of Philosophy, Sciences, and Letters of USP, having presented the thesis *Algumas Proposições Equivalentes ao Axioma da Escolha*. So, Farah obtained, for the second time, the title of Doctor in Sciences (Mathematics) by USP.

[22] See (DA SILVA, 1966, vol. II, p. V).
[23] See (DA SILVA, 1966, vol. II, p. 75-79).
[24] For more information on the circumstances of this course, see (QUINE, 1996, p. 7-13).
[25] (QUINE, 1944) is the first edition; (QUINE, 1996) is a reprint of the same book.
[26] See (GRANGER, 1955).
[27] See (MICALI, 2009).

Newton Carneiro Affonso da Costa, under the supervision of Edson Farah, defended his *Privatzdozent* thesis (also doctoral thesis) *Espaços Topológicos e Funções Contínuas*, at the Faculty of Philosophy, Sciences, and Letters of the Universidade Federal do Paraná (UFPR), in 1959. At the same university he was approved as Full Professor (Mathematical Analysis and Superior Analysis), having presented his thesis *Sistemas Formais Inconsistentes*, in 1964. Da Costa also obtained, for the second time and having as formal advisor Farah, the title of Doctor in Sciences (Mathematics) by UFPR.

At the end of that decade, in 1959, Mário Tourasse Teixeira began his fruitful work of teaching and research at the Faculty of Philosophy, Sciences, and Letters of Rio Claro, located in the State of Sao Paulo[28]. Tourasse spent the period of August 1960 to February 1961 at the Universidad Nacional del Sur, in Bahía Blanca, Argentina (at that time the pioneering center of logic research in Latin America), working with Antonio Aniceto Monteiro and Jean Porte. Under the supervision of Monteiro he began developing his doctoral thesis. He defended his thesis, *M-Álgebra*, at USP, in 1965, having as his formal advisor Edson Farah, and went on to encourage colleagues and students to devote themselves to logic[29].

Leônidas Hegenberg obtained the title of Doctor in Philosophy, under the supervision of Farah, with the thesis *Mudanças de Linguagens Formalizadas*, at USP, in 1968.

Interest in logic grew, and in the early 1960s several elementary logic books were published by Leonidas Hegenberg of the Instituto Tecnológico de Aeronáutica (ITA) in São José dos Campos, São Paulo – his book *Lógica Simbólica*, published in 1966, continues being a reference for elementary studies in the area[30]. Hegenberg, after spending a period at the University of California-Berkeley in 1962, contributed decisively to the dissemination of logic through articles and through intense activity as a teacher, lecturer, and translator[31]. We may also mention the role played by Jorge Emmanuel Ferreira Barbosa of the Universidade Federal Fluminense (UFF) in Niterói, Rio de Janeiro, who formed a small group of researchers, among them Dóris Ferraz Aragon, Ilka Dias de Castro, and Constantino Menezes de Barros. They realized several events at that institution between 1960 and 1962. In 1981 the group founded the Instituto de Lógica, Filosofia e Teoria da Ciência, a private institution that in 1988 was recognized as being of Public Utility.

However, it was in Curitiba, the capital of the state of Paraná, where original research in logic in Brazil really began with the pioneering work of Newton Carneiro Affonso da Costa. Seminars were held under da Costa's leadership, and from 1957 on a

[28] This Faculty, established in 1958, would be among the 14 independent institutions of higher education in the State of São Paulo which would constitute, from January 30, 1976, onward, the Universidade Estadual Paulista 'Júlio de Mesquita Filho' (Unesp).

[29] Antonio Monteiro emigrated from Portugal for political reasons during the dictatorship of António de Oliveira Salazar (whose 'Estado Novo' lasted from 1933 to 1974), as did as several other Portuguese mathematicians in the same period. Initially settling in Rio de Janeiro, Monteiro participated in various academic and institutional activities with Brazilian mathematicians. He eventually had to leave Brazil, also for political reasons, moving to Argentina. See (NOBRE, 1997).

[30] See (HEGENBERG, 1966). See also (HEGENBERG, 1965, 1969).

[31] See, as an example, (HEGENBERG, 1963).

small group of logicians was formed. The participation of Ayda Ignez Arruda, the first disciple and collaborator of da Costa, should be noted in this regard.

In the 1950s, without being aware of the work of the Polish logician Stanisław Jaśkowski (who published two articles in Polish in 1948 and 1949, respectively[32], both of which appeared in English only in 1969) and of the American logician David Nelson[33], da Costa started to develop his ideas about the importance of the study of contradictory theories. Da Costa's paraconsistent calculi were conceived between 1954 and 1958 and presented at seminars and conferences at the Universidade Federal do Paraná (UFPR) and the Universidade de São Paulo.

Ever since his earliest works, da Costa has concerned himself with the possibility of dealing with inconsistent theories. In several articles published in the *Anuário da Sociedade Paranaense de Matemática*, his initial ideas about an alternative logic, capable of dealing with contradictions, show an innovative approach. In 1958, in *Notas sobre o Conceito de Contradição*, da Costa outlines the *Principle of Tolerance in Mathematics*, stating:

> *It is only left to ask whether, from the technical point of view, inconsistent theories have some kind of relevance. Included in this problem, among other things, is the question of knowing just what modifications should be made in the 'logical' structure of similar theories.* [...] *For the time being, we would only like to point out the possibility of investigating inconsistent object languages on an equal footing with the others, and that, syntactically and semantically, inconsistent theories are as licit as consistent ones.* (DA COSTA, 1958, p. 8)

By admitting the study of inconsistent object languages on an equal footing with others, da Costa made a decisive step towards the attainment of paraconsistent logics and in favor of the legitimacy of such theoretical constructs.

The following year, in *Observações sobre o Conceito de Existência em Matemática*, da Costa makes use of the Principle of Amorality in Logic proposed by Carnap, making it one of the bases of his anti-dogmatic posture in logic.[34] In this work, the mature form of the *Principle of Tolerance in Mathematics* is stated:

> *Summing up the thoughts given here, we propose a* Principle of Tolerance in Mathematics, *analogous to that formulated by Carnap for syntax, which may be stated thus: From the syntactic-semantic viewpoint, every mathematical theory is permissible, provided that it is not trivial. In the*

[32] See (JAŚKOWSKI, 1948, 1949, 1969).
[33] See (NELSON, 1949, 1959).
[34] Carnap writes: "*In logic, there are no morals.* Everyone is at liberty to build up his own logic, i.e. his own form of language, as he wishes. All that is required of him is that, if he wishes to discuss it, he must state his methods clearly, and give syntactical rules instead of philosophical arguments." (CARNAP, 1937, p. 52).

> *broad sense*, there exists, *in mathematics, that which* is not trivial. (DA COSTA, 1959, p. 18)

Having presented his ideas at the meeting of the Brazilian Society for the Progress of Science (SBPC) that was held in Curitiba in July of 1962, da Costa published his first notes on inconsistent and non-trivial calculi in the journal *Ciência e Cultura* in the same year. The full development of these ideas appeared the following year, in March of 1963, when da Costa defended his *Habilitationsschrift* for the Chair of Mathematical Analysis and Higher Analysis at the Universidade Federal do Paraná, entitled *Sistemas Formais Inconsistentes*. In this work, da Costa presents the logics underlying formal systems that can be inconsistent without being trivial. Da Costa explains his work as follows:

> *The central idea of the present work consists, roughly, in the following: a formalized deductive system having as its basis elementary classical logic (or intuitionistic logic, or various forms of polyvalent logics, ...), if inconsistent, is trivial in the sense that all of its propositions are demonstrable; and therefore, regarded in this manner, it presents no special mathematical interest. However, for various reasons, as, for example, for the purpose of comparative analyses with consistent systems and for the appropriate evaluation, from the metamathematical point of view, of various principles in operation, it becomes useful to study inconsistent systems* directly. *But, to this end, it is essential to structure new types of elementary logic, with whose assistance such systems can be manipulated.* (DA COSTA, 1993, p. 3)[35]

In *Sistemas Formais Inconsistentes* (DA COSTA, 1963) the goals of da Costa's pioneering work were already clearly defined. He introduces his hierarchies of logical calculations for the study of inconsistent (contradictory) but non-trivial theories: the hierarchy of *propositional calculi* C_n, $1 \leq n \leq \omega$, the hierarchy of *predicate calculi* C_n^*, $1 \leq n \leq \omega$, the hierarchy of *predicate calculi with equality* $C_n^=$, $1 \leq n \leq \omega$, and the hierarchy of *calculi of descriptions* D_n, $1 \leq n \leq \omega$. The new logics must be maximally conservative over classical logic, given that if the principle of (non-)contradiction ($\neg(A \,\&\, \neg A)$) is valid for a given formula *A*, then *A* must behave like a classical (consistent) formula and is said to be 'well behaved'. Paraconsistent theories extend classical theories, in the same way that the geometry of Poncelet is an extension of standard Euclidean geometry.

In the same year of 1963, the Brazilian mathematician Artibano Micali personally delivered three articles by da Costa to Marcel Guillaume, professor at the Université de Clermont-Ferrand, who sent them to the French mathematician René Garnier, professor at the Sorbonne and member of the Academy of Sciences of Paris. Garnier presented da Costa's article *Calculs Propositionnels pour les Systèmes Formels Inconsistents* at the Academy. A bit of a fuss was created over the publication of the article, because some

[35] This book is a reprint of da Costa's *Habilitationsschrift*.

members of the Academy objected that the work could not be published in *Comptes Rendues de l'Académie de Sciences de Paris* because the term *inconsistent* wasn't part of the French language. Marcel Guillaume researched the literature until he verified that Poincaré had used the term at the end of the 19th century.

Only then was da Costa's first note on paraconsistent logic published.[36] This is the first work of research in logic by a Brazilian to appear in a journal of international circulation. Da Costa then initiated in that year the publication of a series of articles in which he introduced his well known hierarchies of paraconsistent calculi.[37]

In 1964, Marcel Guillaume spent three months as a visiting professor in Curitiba at the invitation of da Costa, which contributed to an intensification of research in logic in the country. That same year, Ayda Ignez Arruda, also of the Universidade Federal University do Paraná, published his first works in collaboration with da Costa, introducing the hierarchy of theories of paraconsistent sets $\mathbf{NF}_i$, $1 \leq n \leq \omega$.[38]

In 1968 da Costa moved to São Paulo, where a pioneering group of scholars in logic was being established at the Department of Mathematics (and later also at the Department of Philosophy) of the Universidade de São Paulo, under the coordination of Edson Farah. The São Paulo Group, as it became known, included da Costa, Benedito Castrucci, Leonidas Hegenberg, Jacob Zimbarg Sobrinho, and Mário Tourasse Teixeira[39]. Each of these professors played an important role in Brazilian logic in the following decades, being responsible for the encouragement of high levels of teaching and research in contemporary logic, as well as for the training of some of the best researchers working today at various educational and research institutions in Brazil and other Latin American countries. At the same time, da Costa also taught in the Department of Mathematics (and later in the Department of Philosophy) at the Universidade Estadual de Campinas (Unicamp), where Ayda Arruda also began teaching in 1968. Under the leadership of da Costa, and the unconditional support of Ubiratan D'Ambrosio, the Director of the Institute of Mathematics and Computer Science[40] (IMECC) at Unicamp, there gradually came together a group of young logicians at Unicamp, known as the Campinas Group.

2.2. The first Brazilian Doctoral Thesis in Logic (1950-1990)

The first Brazilian institution to grant the Doctor Degree, was the Universidade de São Paulo, USP.[41] As already mentioned in the previous section, Edson Farah, after having obtaining the title of Doctor in Science (twice), was the advisor of Newton da Costa (UFPR, 1959 and 1964), Mário Tourasse Teixeira (USP, 1959) and Leônidas Hegenberg (USP, 1968).

[36] See (MICALI, 2011) and (DA COSTA, 1963b).
[37] See (DA COSTA, 1964a, 1964b, 1964c, 1964d, 1965, 1974).
[38] See (ARRUDA, 1964).
[39] See (DE MORAES, 2007) and (SOUTO, 2007).
[40] IMECC was at the time known as the Instituto de Matemática, Estatística e Ciência de Computação. The last element of its official name was later changed to 'Computação Científica'.
[41] See (SILVA and AZEVEDO, 2006).

Following, we mention several of the Doctoral Thesis in Logic, in Brazil, during the period 1950-1990. Farah advisored 4 other doctoral thesis related to logic: Ofélia Teresa Alas, *Sobre uma Extensão do Conceito de Compacidade e suas Aplicações*, Doctor in Sciences (Mathematics), USP, 1968; Jacob Zimbarg Sobrinho, *Algumas Aplicações do Axioma da Regularidade na Axiomática de Zermelo Fraenkel*, Doctor in Sciences (Mathematics), USP, 1970; Francisco Miraglia Neto, *Tópicos de Teoria Axiomática de Conjuntos*, Doctor in Sciences (Mathematics), USP, 1971; Alésio de Caroli, *Sobre a Teoria dos Universos*, Doctor in Sciences (Mathematics), USP, 1973.

Newton da Costa supervised, until the end of the 80s, several doctoral thesis: Ayda Ignez Arruda, *Considerações sobre os Sistemas Formais* NF_n, Doctor in Sciences (Mathematics), UFPR, 1966; Lafayete de Moraes, *Lógica Discursiva e Modelos de Kripke*, Doctor in Philosophy, Pontifícia Universidade Católica de São Paulo (PUC-SP), 1973; Antonio Mário Antunes Sette, *O Forcing de Fraissé (Um Estudo Comparativo)*, Doctor in Sciences (Mathematics), USP, 1977; Luiz Paulo de Alcântara, *Axiomas do Infinito na Teoria Axiomática de Conjuntos*, Doctor in Mathematics Education, PUC-SP, 1977; Amadeo Peter Hiller, *Sistemas Auto-referentes e o Paradoxo de Russell*, Doctor in Sciences (Mathematics), USP, 1981; Walter Alexandre Carnielli, *Sobre o Método dos Tableaux em Lógicas Polivalentes Finitárias*, Doctor in Sciences (Mathematics), Unicamp, 1982; Itala Maria Loffredo D'Ottaviano, *Sobre uma Teoria de Modelos Trivalente*, Doctor in Sciences (Mathematics), Unicamp, 1982; Mineko Yamashita, *O Símbolo Epsilon de Hilbert em Lógica Paraconsistente*, Doctor in Mathematics Education, PUC-SP, 1985; Leila Zardo Puga, *Uma Lógica de Querer: preliminares sobre um tema de Mally*, Doctor in Mathematics Education, PUC-SP, 1985; Celina Aparecida Almeida Pereira Abar, *Descrição e Paraconsistência*, Doctor in Mathematics Education, PUC-SP, 1985; Clara Helena Sánchez Botero, *Aspectos da Eliminabilidade dos Operadores Normais*, Doctor in Philosophy, Unicamp, 1988; Walzi Conceição Sampaio da Silva, *Racionalidade e Paraconsistência: um estudo de caso*, Doctor in Philosophy, USP, 1990; Décio Krause, *Não-Reflexividade, Indistinguibilidade e Agregados de Weyl*, Doctor in Philosophy, USP, 1990.

Mário Tourasse Teixeira supervised two doctoral thesis: Irineu Bicudo, *Sobre o Conceito de Dualidade Matemática*, Doctor in Mathematics Education, PUC-SP, 1973; Albrecht Gerardt Hoppmann, *Fecho e Imersão*, Doctor in Sciences (Mathematics), Unesp-Rio Claro, 1973.

Leônidas Hegenberg supervised the Doctoral thesis in Philosophy of Elias Humberto Alves, *O Descritor em Lógica Modal*, at PUC-SP, 1973.

Jacob Zimbarg Sobrinho was the advisor of João Carlos Prandini, thesis *O Observador como Parte da Descrição*, Doctor in Sciences (Mathematics), USP, 1989. Andrea Maria Altino de Campos Loparic defended the thesis *Definição de Conjuntos Decidíveis de Valorações pela Fatorização da Linguagem*, advisored by Balthasar Barbosa Filho, having obtained the title of Doctor in Logic and Philosophy of Science, at Unicamp, 1982. José Alexandre Dury Guerzoni defended the thesis *Semântica Normativa e Lógicas Modais*, advisored by Carlos Alberto Lungarzo, having obtained the title of Doctor in Logic and Philosophy of Science, at Unicamp, 1989.

During the period we are considering, some Brazilian logicians obtained their doctorate (PhD) in foreign universities: Oswaldo Chateaubriand, *Ontic Commitment, Ontological Reduction and Ontology* (Advisor: Charles Chihara), University of California, Berkeley, USA, 1971; Paulo Augusto Silva Veloso, *Networks of Finite-state Machines* (Advisor: Arthur Gill), University of California, Berkeley, USA, 1975; Francisco Miraglia Neto, *On $\square_0$–categorical Biregular Rings* (Advisor: Angus John Macintyre), Yale University, USA, 1977; Luiz Carlos P.D. Pereira, *On the Estimation of the Length of Normal Derivations* (Advisor: Dag Prawitz), University of Stocolm, Sweden, 1982; Ruy de Queiroz, *Proof Theory and Computer Programming: the logical foundation of computation* (Advisor: Thomas Maibaum), Imperial College of Science, Technology and Medicine, London, England, 1990.

2.3. Institutional initiatives in logic in Latin America

Mathematical logic also began to be developed in a number of other countries in Latin America, such as Chile and Argentina. The main center for the study of logic was the Universidad Nacional del Sur, in Bahía Blanca, Argentina, owing to the leadership of Antonio Aniceto Monteiro. Various institutions were fundamental to the qualitative and quantitative increase in the development of logic in Latin America from the 1960s onward.

2.3.1. The Association for Symbolic Logic and the Latin-American Symposia on Mathematical Logic

In 1964 it was proposed that Latin America host symposia under the auspices of the Association for Symbolic Logic (ASL), molded on the European symposia. However, it was Abraham Robinson, President of the ASL, who in 1968 suggested to Rolando Chuaqui of the Universidad Católica de Chile, then a visiting professor at the University of California, that the first Latin American Symposium be held in Chile.

In the same era, the ASL formed the Committee on Logic in Latin America in which the following logicians participated from 1970 to 1976: Newton da Costa (President), Dana Scott, Rolando Chuaqui, and Antônio Monteiro. Continental representation on the Committee was assured by the continuing indication of Latin Americans for the seats held by these individuals.[42] Latin American representation on the Council of the ASL was guaranteed with the triennial term conferred upon Newton da

[42] The following scholars have had seats on Committee on Logic in Latin America: Itala M. Loffredo D'Ottaviano (1990–93, 1993–95, 1995–98); Roberto L.O. Cignoli (1993–96, 1996–99); Xavier Caicedo (1993–96, 1996–99, 2008–11); Renato Lewin (1992–95, 1995–98); Antonio M. A. Sette (1995–98); Carlos Uzcategui (1995–98, 1999–2003, 2003–04); Francisco Miraglia Neto (1999–2003, 2003–05); Irene Mikenberg (1999–2003, 2003–05, 2005–08); Luis Jaime Corredor (1999–2003, 2003–06); Guillermo Martinez (1999–2003, 2003–06); Ramón Pino Pérez (2004–07, 2007–10); Ricardo Bianconi (2005–08, 2008–11); Alejandro Petrovich (2006–09, 2009–12); Andres Villaveces (2006–09, 2009–12); Carlos Di Prisco (2007–10, 2010–13); Ruy de Queiroz (2010–13); Walter Carnielli (2011-14). For a list of the current members of the Committee, see *http://aslonline.org/info-council.html*.

Costa, which ended in 1973, and continued with the terms of Rolando Chuaqui, ending in 1976, Ayda Arruda, ending in 1983, Ruy de Queiroz, with a term during the period 2007-2009, and Carlos Di Prisco, whose first mandate ended in 1998 and whose second term is in effect until 2013.

The 1st Latin American Symposium on Mathematical Logic (SLALM) was held in July of 1970 in Santiago at the Universidad Católica de Chile, with the participation of a number of Brazilians, some of whom were invited as guest lecturers.

The 2nd SLALM was held at the Universidade de Brasília (UnB) in July 1972. The following logicians participated as conference members at this symposium: Rolando Chuaqui (Chile), Roberto Cignoli (Argentina), Maximiliano Dickmann (France), Marcel Guillaume (France), Luis Monteiro (Argentina), Abraham Robinson (USA), Patrick Suppes (USA), Ayda Arruda, and Newton da Costa. There were quite a few participants, for the most part Brazilians, many of whom were interested in the introductory logic courses taught at the pre-symposium which was organized at the Instituto Tecnológico da Aeronáutica (São José dos Campos, São Paulo) as a preparation for the event. During the 2nd SLALM it was decided that the next Latin American Symposium would be held in Bahía Blanca, Argentina, in July 1974. This event never occurred, however, due to the terrible and difficult political situation created by the military dictatorship to which that country was subjected at the time.

After a four-month visit to Chile in March of 1975, Alfred Tarski, accompanied by Rolando Chuaqui, visited the Institute of Mathematics, Statistics and Computer Science (IMECC) at the Universidade Estadual de Campinas. A small symposium on mathematical logic, organized by Ayda Arruda, took place at IMECC with the participation of logicians and students of Unicamp, USP, and the Universidade Federal de Pernambuco (UFPE), the proceedings of which were published by Arruda with the collaboration of Itala M. Loffredo D'Ottaviano.[43] Tarski gave two long conferences on relation algebras, with the presentation of suggestive problems on topics that were open questions at the time. The conferences were filmed, and these records comprise part of the collection of the Historical Archives on History of Science at Centre for Logic, Epistemology and the History of Science (CLE) at Unicamp.[44]

With the growing number of Brazilian logicians, it was decided that the 3rd SLALM would be held at Unicamp, under the sponsorship of the Association for Symbolic Logic, with the support of its Vice President, Joseph R. Shoenfield, who appointed the third Committee on Logic in Latin America, consisting of Rolando Chuaqui (President), Newton da Costa, and the Peruvian philosopher Francisco Miró-Quesada.

The 3rd Latin American Symposium on Mathematical Logic was held at IMECC-Unicamp from July 12 to 16, 1976, preceded by an entire semester of courses and seminars for graduate students. The Symposium consisted of three sessions: model theory, non-classical logic, and computability. The event, excellently organized by Ayda Arruda, was a great success. Many young logicians from Brazil and other Latin American countries

[43] See (ARRUDA, 1975).

[44] Leandro Suguitani, a doctoral student at CLE-Unicamp advised by D'Ottaviano, has recently studied this material. A transcript of the conferences given by Tarski at CLE will be soon be available to the scientific community. See (SUGUITANI, 2008).

attended, among them Xavier Caicedo (Colombia), Irene Mikenberg (Chile), and Manuel C. Corrada (Chile). Several important logicians participated as guest lecturers, including F.G. Asenjo (USA), M. Benda (USA), R. Chuaqui (Chile), R. Fraissé (France), J. Kotas (Poland), M. Krasner (France), E.G.K. López-Escobar (USA), C. Pinter (USA), R. Routley (Australia), J. R. Shoenfield (USA), and R. Solovay (USA). At one of the sessions of the symposium there occurred an important event relative to paraconsistent logic: the proposal by Francisco Miró-Quesada of the term 'paraconsistent' for referring to logics that can underlie non-trivial inconsistent theories.

The first complete proceedings of a Latin American Symposium on Logic were published by North-Holland in 1977 in the series *Studies in Logic and the Foundations of Mathematics*, edited by Arruda, da Costa, and Chuaqui under the title *Non-Classical Logics, Model Theory and Computability*.[45]

The SLALMs have continued to grow in size and comprehensiveness. Before completing the description of the other Symposia, however, it is necessary to recount the founding and the emergence of other important institutions and events that have contributed to the study of logic in Latin America.

2.3.2. The Centre for Logic, Epistemology and History of Science at Unicamp

The Latin-American Symposia on Mathematical Logic and contact with logicians of other nationalities strengthened the development of logic in Brazil, whether through the exchange of experiences or though the theoretical synchrony thus established. This scenario became clearly established in the 1960s and intensified in the following decades.

The fruitful experiences of Brazilian students in the U.S. and Europe should be noted in this respect. These student exchanges contributed greatly to widening the horizons of logical studies in Brazil, and were made possible thanks to the vigorous support of National Council for Scientific and Technological Development (CNPq) of the Brazilian government. As a result of this support, quite a few Brazilian scholars have been trained in Europe at French, Belgian, German, and Scandinavian universities. A good example this kind of international exchange was the intense participation of Brazilians in the celebrated Group in Logic and the Methodology of Science at the University of California, Berkeley, which brought together around the figure of Alfred Tarski (1901–1983) some of the 20th century's best specialists in the logic, including Henkin, Craig, Addison, Vaught, and Mates.

Oswaldo Porchat Pereira, on his return to Brazil after a successful period (1969-1970) of post-doctoral studies in that group, proposed in the late 1970s the creation of a similar research center at the University of São Paulo. This did not occur, according to Porchat, for reasons having to do with political-ideological resistance at USP. The Centre for Logic, Epistemology and the History of Science (CLE), organized in 1976, was officially installed in 1977 at the newly created University of Campinas as a result of the efforts of Porchat and the physicist Rogério César de Cerqueira Leite of that University. In

[45] See (ARRUDA, DA COSTA and CHUAQUI, 1977).

the years that followed, CLE brought together numerous scholars, and trained many individuals who are today engaged in teaching and research. In addition, CLE fomented logical research in the country in a way that was unique and unprecedented in Brazilian academic history.[46]

Officially established in 1977 by Prof. Zeferino Vaz, then Rector of Unicamp, CLE was conceived in order to promote research in the areas of logic, epistemology, and the history of science, as well as interdisciplinary work, the organizing of seminars and scientific meetings, the publication of research, and the maintenance of academic exchanges with other research groups and institutions in Brazil and in other countries.

CLE constituted the first interdisciplinary academic institution in its areas of research in Brazil, and possibly in all of Latin America, having the objective of bringing together scholars from various branches of scientific and philosophical knowledge. CLE currently has over 100 members, including researchers from various institutes and departments at Unicamp and other Brazilian, American, and European universities. In addition to logicians and philosophers, CLE's associates include social scientists, linguists, mathematicians, physicists, biologists, psychologists, and teachers of the arts.

The first Director of CLE was Oswaldo Porchat Pereira (1977–1982), followed by Zeljko Loparić (1982–1986), Itala M. Loffredo D'Ottaviano (1986–1993), Osmyr Faria Gabbi Jr. (1993–1999), Walter A. Carnielli (1999–2005), Itala M. Loffredo D'Ottaviano (2005–2009), and Walter A. Carnielli (2009–present).

In the more than 30 years since its foundation, CLE has maintained an intense program of scientific exchange and academic cooperation with other academic institutions, both in Brazil and abroad, that are known for excellence in teaching and research.

With the support of foreign and Brazilians institutions which promote research and teaching, CLE has sponsored more than 100 large and medium-sized academic events, as well as numerous conferences, seminars, and courses. CLE has also received over 500 well known researchers as visitors. Among these, the following may be mentioned: Alfred Tarski (Berkeley, USA), Andrés Raggio (Buenos Aires, Argentina), Carlos Di Prisco (Caracas, Venezuela), Cecilia Rauszer (Warsaw, Poland), Claudio Pizzi (Siena, Italy), Daniel Isaacson (Oxford, England), Daniel Vanderveken (Montreal, Canada), Daniele Mundici (Florence, Italy), David Miller (London, England), Diego Marconi (Torino, Italy), Don Pigozzi (Iowa, USA), Edgard G.K. López-Escobar (Maryland, USA), Eduardo Rabossi (Buenos Aires, Argentina), Ezequiel Olasso (Buenos Aires, Argentina), G. Malinowski (Lodz, Poland), Gonzalo Reyes (Montreal, Canada), Gottfried Gabriel (Konstanz, Germany), Helena Rasiowa (Warsaw, Poland), Jaakko Hintikka (Boston, USA, and Finland), Jeff Paris (Manchester, England), John Corcoran (Buffalo, USA), John Lucas (Oxford, England), Justus Diller (Münster, Germany), Maximiliano Dickmann (Paris, France), Michal Krynicki (Warsaw, Poland), Raymundo Morado (Mexico City, Mexico), Richard L. Epstein (Berkeley, USA), Richard Routley (Canberra, Australia), Rizsard Wojcicki (Warsaw, Poland), Roberto Cignoli (Buenos Aires, Argentina), Rolando Chuaqui (Santiago, Chile), Saul Kripke (New York, USA), Xavier Caicedo (Bogotá, Colombia).

[46] See (D'OTTAVIANO, CARNIELLI and ALVES, 1996).

CLE has maintained the continuous and regular editing of important scholarly journals. The first of these is *Manuscrito – Revista Internacional de Filosofia*, a semiannual periodical of international circulation that has been edited without interruption since 1977. So far, 65 numbers (totaling 32 volumes) have been published, with articles in Portuguese, Spanish, English and French. Aside from Oswaldo Porchat Pereira (1978–1983), who was the founder and first editor of the publication, the journal has been edited by Marcelo Dascal (1983–1998), Michael Beaumont Wrigley (1999–2003), and, since 2003, by Marco Antonio Ruffino, with André Leclerc as associate editor since 2009. *Manuscrito* is indexed in *The Philosopher's Index* and the *Repertoire Bibliographique de la Philosophie*. Recently, in August 2010, the journal became part of the SciELO Brazil online publications collection.

Another regular publication of CLE is the semiannual *Cadernos de História e Filosofia da Ciência*, founded in 1980 by Zeljko Loparić, who directed the collection until 1988. At this writing, 56 issues of this periodical have been published. Roberto de Andrade Martins and Michel Octave Ghins have edited the series, and Fatima Regina Rodrigues Évora has been the editor since 1991.

Since 2003, the *CLE e-Prints* in electronic format have replaced the old pre-publications of CLE, making unpublished research results easily available before they appear in final form in other periodicals. The series is edited by Walter Alexandre Carnielli and Marcelo Esteban Coniglio. The papers published in *CLE e-prints* can be accessed at:

http://www.cle.unicamp.br/e-prints

These items are organized in annual volumes, numbering 11 at present.

Another pioneering electronic publication under CLE's auspices is the *Kant e-Prints* series. Since its founding in 2002, the series has been edited by Zeljko Loparić. The first series of *Kant e-Prints* (2002–04) totals 3 volumes; a second series, ongoing since 2006, now totals 5 volumes. The publication is accessible on line at:

http://www.cle.unicamp.br/kant-e-prints/index.htm

The first academic journal of international circulation dedicated to non-classical logics, *The Journal of Non-Classical Logic*, was created at CLE in 1982, having had as its editors Newton da Costa, Luiz Paulo Alcântara, and Itala M. Loffredo D'Ottaviano. After the publication of 8 volumes and 14 numbers, it merged in 1992 by formal agreement with the *Journal of Applied Non-Classical Logics*, which had begun publication in 1991 in Toulouse, France. The new publication, which inherited the title of the French journal, is published by Hermès-Lavoisier (Paris), with Luis Fariñas del Cerro (Université de Toulouse) as editor, and with five members of the editorial council of the earlier CLE journal as members of the new editorial council. At present, 19 volumes have been published, with numbers appearing triannually.

Since 1987, CLE has also published a collection of books dedicated to pure and applied logic, as well as monographs and collections devoted to the history of philosophy and to the epistemology and methodology of science. The *Coleção CLE* is published in

Portuguese, as well as in Spanish and English, with at least two titles per year. Since its inception the collection's editor has been Itala M. Loffredo D'Ottaviano, and more than 60 volumes have been published so far. This series, several volumes of which are on logic, has received the support of Unicamp and the São Paulo Research Foundation (FAPESP).

The Michel Debrun Library at CLE has one of the best specialized collections in Latin America in the areas of logic, epistemology, and the history of science.

Also located at CLE are the Historical Archives on the History of Science, a collection of over 100,000 manuscripts and documents stored in different media.

CLE gave academic and administrative support to the specialization courses offered by Unicamp until early in the last decade, as well as to the Graduate Program in Logic and Philosophy of Science at Unicamp's Department of Philosophy. The latter was a pioneering course in Brazil that was created almost simultaneously with CLE and was the forerunner of the current Graduate Program in Philosophy. The logicians teaching in the current program are also part of the Group for Theoretical and Applied Logic at CLE.

In addition to the weekly logic seminar, which is also part of the activities of the Graduate Program in Philosophy at Unicamp, the Group for Theoretical and Applied Logic organizes the Colloquium Logicae, regular advanced seminars open to the entire academic community and benefitting from the participation of invited researchers.

Since 1986, CLE has maintained a regular interdisciplinary seminar on systemics, self-organization, and information. The CLE Interdisciplinary Self-Organization Group, in which CLE logicians participate, was coordinated by Michel Maurice Debrun until 1997, and has since then been coordinated by Itala M. Loffredo D'Ottaviano.

The CLE website contains information on the Centre's history, research groups, publications, events, and other activities, and is accessible at:

http://www.cle.unicamp.br

2.3.3. The first Brazilian Logic Conferences

Shortly after the creation of CLE, the logic section decided to organize regular Brazilian logic conferences, with the goal of promoting communication between Brazilian logicians and stimulating logic research within the country. Since 1978, CLE has co-sponsored all of the Brazilian Logic Conferences (EBLs), as well as all of the Latin-American Symposia on Mathematical Logic (SLALMs).

The first EBL occurred in Campinas in 1977, cosponsored by IMECC-Unicamp, with participants from nearly 10 Brazilian universities. The proceedings of the event were published in 1978 by Marcel Dekker, under the title *Mathematical Logic – Proceedings of the First Brazilian Logic Conference*, edited by Arruda, da Costa and Chuaqui.[47]

In 1978, the 2nd EBL took place, again in Campinas, with the goal of making logic known among Brazilian students. It was a great success, with the participation of 53

[47] See (ARRUDA, DA COSTA and CHUAQUI, 1977).

professors and 101 students from several Brazilian universities. Tutorials and conferences on advanced topics of logic were held during the event.

After a year dedicated to logic at the Universidad Católica de Chile, the 4th SLALM was held from the December 18 to 22, 1978, in Santiago. In the two weeks preceding the event, courses were taught on advanced topics in logic by A.I. Arruda, N.C.A. da Costa, J. Bosch (Argentina), L.F. Cabrera (Chile), U. Felgner (West Germany), and J. Malitz (USA). Among the invited participants were M. Benda (USA), X. Caicedo (Colombia), E.G.K. López-Escobar (USA), J.R. Lucas (England), C. Pinter (USA), W. Reinhardt (USA), R. Vaught (USA) and, from Brazil, A.I. Arruda, N.C.A. da Costa, A.M. Sette, M.S. de Gallego, O. Chateaubriand, H. Sankappanavar, and E.H. Alves.

The proceedings of the 4th SLALM, once again edited by Arruda, da Costa, and Chuaqui, were dedicated to Alfred Tarski and published in 1980 by North-Holland in the *Studies in Logic and the Foundations of Mathematics* series, under the title *Mathematical Logic in Latin America*.[48]

2.3.4. The Brazilian Logic Society

With the great impetus to the development of logic in Brazil, the Brazilian participation in international events, and the publication by Brazilians in journals of international circulation, there naturally arose the proposal for the creation of a society that would bring together Brazilian logicians. The process of the academic-institutional emergence of a community dedicated to logic intensified with the foundation of the Brazilian Logic Society (SBL). This occurred on February 14, 1979, in a meeting at IMECC-Unicamp that was chaired by Oswaldo Porchat Pereira, mentor, founder, and first director of CLE.

The SBL aims to bring together logicians and scholars of logic in all its aspects from Brazil as well as from abroad, to stimulate and maintain an active interest in logic and its applications within the country, to encourage research, and to contribute to the improvement of this branch of knowledge.[49]

The following scholars were among the founding members of the SBL: Andrea Maria Altino Campos Loparić, Antonio Mário Antunes Sette, Ayda Ignes Arruda, Benedito Castrucci, Celso Volpe, Cezar Shintaro Mizuno, Clara Helena Sanches Botero, Elias Humberto Alves, Francisco Miraglia Neto, Harvey Robert Brown, Iole de Freitas Druck, Itala Maria Loffredo D'Ottaviano, Jacob Zimbarg Sobrinho, José Eduardo de Almeida Moura, Leonidas Hegenberg, Luiz Paulo de Alcântara, Luiz Henrique Lopes dos Santos, Marta Sagastume Galego, Matias Francisco Dias, Newton Carneiro Affonso da Costa, Oswaldo Chateaubriand Filho, Oswaldo Porchat Pereira, Paulo Augusto da Silva Veloso, Raul Ferreira Landim Filho, Roberto Leonardo Oscar Cignoli, Stavros Christodoulou, Ubiratan D'Ambrosio, Walter Alexandre Carnielli, and Zeljko Loparić.

Since its creation, the Brazilian Logic Society has been based at CLE-Unicamp.

[48] See (ARRUDA, DA COSTA and CHUAQUI, 1980).
[49] See *www.cle.unicamp.br/sbl*.

The first directorate of the SBL, elected at its founding and with a term for the period from 1979 to 1981, consisted of the following professors: Newton da Costa (USP), President; Antonio Mário Sette (UFPE), First Vice-President; Raul Ferreira Landim Filho (PUC-RJ), Second Vice-President; Ayda Ignez Arruda (Unicamp), General Secretary; Elias Humberto Alves (Unicamp), Subsecretary; Jacob Zimbarg Sobrinho (USP), Treasurer.

The directorates elected for subsequent terms, from 1981 to 1995, consisted of the following individuals: from 1981 to 1982: Ayda Ignez Arruda (Unicamp), President; Jacob Zimbarg Sobrinho (USP), First Vice-President; Elias Humberto Alves (Unicamp), General Secretary; Itala M. Loffredo D'Ottaviano (Unicamp), Subsecretary; Antonio Mário Sette (Unicamp), Treasurer; from 1983 to 1984: Roberto L.O. Cignoli (Unicamp), President; Francisco Miraglia Neto (USP), First Vice-President; Paulo Augusto da Silva Veloso (PUC-RJ), Second Vice-Presidente; Itala M. Loffredo D'Ottaviano (Unicamp), General Secretary; Irineu Bicudo (Unesp, Rio Claro), Subsecretary; Luiz Paulo de Alcântara (Unicamp), Treasurer; from 1985 to 1988: Oswaldo Chateaubriand (PUC-RJ), President; Luiz Paulo de Alcântara (Unicamp), First Vice-President; Luiz Henrique Lopes dos Santos (USP), Second Vice-President; Paulo Augusto da Silva Veloso (UFRJ), Secretary; José Eduardo Moura (UFRN), Subsecretary; Luiz Carlos P.D. Pereira (PUC-RJ), Treasurer; from 1988 to 1993: Newton C.A. da Costa (USP), President; Luiz Carlos P.D. Pereira (PUC-RJ), First Vice-President; Mineko Yamashita (PUC-SP), General Secretary; Elias Humberto Alves (Unicamp), Subsecretary; Celina Aparecida Almeida Pereira Abar (PUC-RJ), Treasurer; from 1994 to 1995: Itala M. Loffredo D'Ottaviano (Unicamp), President; Edward Hermann Haeusler (PUC-RJ), First Vice-President; Walter Alexandre Carnielli (Unicamp), Second Vice-President; Mamede Lima-Marques (UnB), General Secretáry; Décio Krause (UFSC), Subsecretary; Cosme Damião Bastos Massi (Unesp, Marília), Treasurer.

In the period from 1996 to 2003, the SBL presidency was held by Itala M. Loffredo D'Ottaviano and the other members of the directorate during this period were as follows. From 1996 to 1998: Paulo Augusto da Silva Veloso (UFRJ), First Vice-President; Antônio Mário Antunes Sette (Unicamp), Second Vice-President; Jairo José da Silva (Unesp, Rio Claro), General Secretary; Luiz Carlos P.D. Pereira (PUC-RJ), Subsecretary; Elias Humberto Alves (Unesp, Marília), Treasurer. From 1999 to 2001: Paulo Augusto da Silva Veloso (UFRJ), First Vice-President; Francisco Miraglia Neto (USP), Second Vice-President; Jairo José da Silva (Unesp, Rio Claro), Secretary; Luiz Carlos P.D. Pereira (PUC-RJ), Subsecretary; Marcelo Esteban Coniglio (Unicamp), Treasurer.

For the period from 2003 to 2006, the following directorate was elected: Oswaldo Chateaubriand Filho (PUC-RJ), President; Jairo José da Silva (Unesp, Rio Claro), First Vice-President; José Carlos Cifuentes (UFPR), Second Vice-President; Luiz Carlos P.D. Pereira (PUC-RJ), General Secretary; Marcelo Esteban Coniglio (Unicamp), Subsecretary; Edward Hermann Haeusler (PUC-RJ), Treasurer.

The directorate for 2006 to 2008 consisted of the following professors: Walter Alexandre Carnielli (Unicamp), President; Décio Krause (UFSC), First Vice-President; Frank Thomas Sautter (UFSM), Second Vice-President; Marcelo Esteban Coniglio (Unicamp), General Secretary; Mário Benevides (COPPE-UFRJ), Treasurer; for 2008 to 2011, it was comprised of: Walter Alexandre Carnielli (Unicamp), President; Edward

Hermann Haeusler (PUC-RJ), First Vice-President; Hércules de Araújo Feitosa (Unesp, Bauru), Second Vice-President; Marcelo Esteban Coniglio (Unicamp), General Secretary. The post of Subsecretary is held by Daniel Durante Pereira Alves (UFRN) and the post of Treasurer by Itala M. Loffredo D'Ottaviano (Unicamp).

The present directorate of the SBL, with a term for 2011 to 2013, is comprised of: Itala Maria Loffredo D'Ottaviano (Unicamp), President; Maria da Paz Nunes de Medeiros (UFRN), First Vice-President; Wagner de Campos Sanz (UFG), Second Vice-President; Samuel Gomes da Silva (UFBA), General Secretary; Jean-Yvez Béziau (UFRJ), Subsecretary; Marcelo Estevan Coniglio (Unicamp), Treasurer.

The SBL maintains close scientific relations with logicians and research groups throughout Latin America, with the Association for Symbolic Logic, and particularly with the Committee on Logic in Latin America, a body which has been presided over by Newton da Costa (1970–76), Itala M. Loffredo D'Ottaviano (1993–98), and Francisco Miraglia Neto (1999–2005).

2.3.5. Consolidation of regular academic meetings

Beginning in 1979, the Brazilian Logic Society and CLE began to co-sponsor the Brazilian Logic Conferences (EBLs).

The 3rd EBL was held in Recife in 1979, cosponsored by the Universidade Federal de Pernambuco and coordinated by Antonio Mário Sette. The proceedings were edited by the SBL.[50]

The 4th and 5th EBLs were conducted at CLE-Unicamp, in 1980 and 1981, respectively.

The 5th SLALM was held at the Universidad de Los Andes in Bogotá, Colombia, in 1981, coordinated by Xavier Caicedo. It was dedicated to the memory of Antonio Monteiro, the Portuguese mathematician responsible for the first group of logicians in Latin America at the Universidad del Sur, Bahía Blanca, Argentina. The opening conference lecture at the event, dedicated to Monteiro, was given by his disciple and collaborator Roberto Cignoli. From Brazil, Arruda, da Costa, Sette, and D'Ottaviano attended.

At the 6th EBL, held in Fortaleza at the Universidade Federal do Ceará (UFCE) in 1982, it was decided that the EBLs would be held every two years, alternating with the realization of the Latin-American Symposia on Mathematical Logic.

In accord with this decision, the 7th EBL took place at the Pontifícia Universidade Católica do Rio de Janeiro (PUC-RJ) in 1984. The 8th EBL occurred in São José dos Campos at the Instituto Tecnológico de Aeronáutica in 1986, and the 9th EBL at the Pontifícia Universidade Católica de São Paulo (PUC-SP) in 1988.

The 6th SLALM was held in Caracas, Venezuela, in 1983, coordinated by Carlos Augusto Di Prisco, with the participation of da Costa, Arruda, Sette, and D'Ottaviano.

The 7th and 8th SLALMs occurred in Brazil. The 1985 event occurred at Unicamp and was coordinated by Walter A. Carnielli and Luiz Paulo de Alcântara. The 1989 event

[50] See (SETTE, 1979).

was held at the Universidade Federal da Paraíba (UFPB), João Pessoa, in 1989, coordinated by Matias Francisco Dias.

The 7th SLALM was dedicated to the memory of Ayda Ignez Arruda, who died prematurely in October 1983 at 47 years of age, and whose work and commitment were fundamental to the creation of the first group of logicians at Unicamp, to the creation of CLE and of the Brazilian Logic Society, to the realization of the EBLs and SLALMs, to the editing of the first proceedings of logic events held in Latin America, as well as to visits by eminent logicians to Unicamp. The homage to Arruda at the opening of the event was given by Newton da Costa.

The 9th SLALM occurred in 1992 at the Universidad Nacional de Sur, Bahía Blanca, Argentina, coordinated by Manuel I. Abad and dedicated to the memory of the Argentine logician Andrés R. Raggio (1927–1991), recently deceased at the time. The memorial lecture in honor of Raggio was given by Itala M. Loffredo D'Ottaviano.

The 10th EBL occurred in 1993 in Itatiaia, Rio de Janeiro, with the participation of the most prominent logicians in Brazil and Latin America, as well as many Brazilian graduate students, and with a special emphasis on non-classical logics. This event was also dedicated to the memory of Andrés R. Raggio, who was member of CLE and a teacher and friend of many of the participants. With his logico-philosophical training and engaging personality, Raggio contributed greatly to the development of logic in South America. The conference lecture in Raggio's honor was delivered by Itala M. Loffredo D'Ottaviano, and the proceedings were published in the *Coleção CLE* (vol. 14, 1995), edited by Walter A. Carnielli and Luis Carlos P. D. Pereira, under the title *Logic, Sets, and Information*.

Ruy Guerra de Queiroz, lecturer at Universidade Federal de Pernambuco since 1994, organizes and coordinates the Workshops on Logic, Language, Information and Computation (WoLLICs), an annual event supported by the Association for Symbolic Logic. Well known researchers from Brazil and from abroad have participated in the WoLLICs, and the proceedings of these events have been published in respected journals of international circulation. The first and second WoLLICs were held in Recife, Pernambuco, in 1994 and 1995 (see 3.5, below).

The 10th SLALM was held at the Universidad de Los Andes, Bogota, from July 24 to 29, 1995, coordinated by Xavier Caicedo. Beforehand, from the July 17 to 22, four mini-courses in logic were taught by researchers at the Universidad Nacional de Colombia. The Symposium was dedicated to the memory of Rolando Chuaqui, who died in Santiago, Chile, in March 1994, in recognition of the important role he played in the development of logic in Latin America. Chuaqui was the first President of the Committee on Logic in Latin America of the ASL, initiated the SLALMs in 1970, and participated actively in the organization of all of them until his death. The opening lecture of the event, which discussed his life and work, was given by his disciple and collaborator Renato Lewin (Universidad Católica de Chile).

Since the 10th SLALM, all of the Symposia have been preceded by a Logic School, in which invited specialists give tutorials in introductory and advanced logic to both students and researchers.

The 11th EBL took place in 1996 at the Federal University of Bahia (UFBA) in Salvador, Bahia, in conjunction with the 3rd WoLLIC. The themes of the conference were

non-classical logics, computability, translations between logics, model theory, proof theory, philosophy of logic, set theory, and algebraic logic. There were 65 presentations, 37 of them by Brazilian logicians and 28 by scholars of other nationalities. Among the Brazilians may be mentioned Antonio Mário Sette (Unicamp), Armando Haeberer (PUC-RJ), Décio Krause (UFPR), Carlos Cifuentes Vazquez (UFPR), Edward Herman Hauesler (PUC-RJ), Elias Humberto Alves (Unesp, Marília), Francisco Antonio Dória (UFRJ), Francisco Miraglia Neto (USP), George Svetlichny (PUC-RJ), Gerson Zaverucha (Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia – COPPE-UFRJ), Irineu Bicudo (Unesp, Rio Claro), Itala M. Loffredo D'Ottaviano (Unicamp), Jairo J. da Silva (Unesp, Rio Claro), Jean-Yves Béziau (LNCC, RJ), Luiz Carlos P. D. Pereira (PUC-RJ), Mário Benevides (COPPE-UFRJ), Michael B. Wrigley (Unicamp), Ofélia T. Alas (USP), Oswaldo Chateaubriand (PUC-RJ), Paulo Augusto da Silva Veloso (PUCRJ), Sheila Veloso (UFRJ), and Walter A. Carnielli (Unicamp). There was strong presence of scholars from other Latin American countries, Europe, and the United States, among them Andreas Blass (USA), Carlos Augusto Di Prisco (Venezuela), Christian Fermueller (Austria), Claudio Pizzi (Italy), Daniel Vanderveken (Canada), Daniele Mundici (Italy), Guillermo Rosado Haddock (Porto Rico), Juliet Floyd (USA), Kosta Dosen (France), Manuel Corrada (Chile), Marta Sagastume Galego (Argentina), Mathieu Marrion (Canada), Michal Krynicki (Poland), Nestor Guillermo Martinez (Argentina), Renato Lewin (Chile), Ugo Moscato (Italy), Wilfred Hodges (England), and Xavier Caicedo (Colombia). The event was dedicated to the memory of Mário Tourasse Teixeira, the conference lecture in his honor being given by Irineu Bicudo. The proceedings, edited by Walter A. Carnielli and Itala M. Loffredo D'Ottaviano, were published by the American Mathematical Society in the *Contemporary Mathematics* series (vol. 235, 1999), under the title *Advances in Contemporary Logic and Computer Science*.[51]

The 12th EBL took place in Itatiaia, Rio de Janeiro, in 1998, in conjunction with that year's WoLLIC. Many graduate students and Brazilian and Latin American logicians participated in this event, which included introductory tutorials.

The 11th SLALM occurred in 1998 in Mérida, Venezuela, and was coordinated by Carlos Augusto Di Prisco and Carlos Uzcátegui.

3. Final Observation

The second part of this paper, *On the development of logic in Brazil II: recent initiatives in Brazil related to logic, and Brazilian research groups dedicated to logic*, will appear in the next number of Revista Brasileira de Matemática.

It contemplates the recent **EBL's** and **SLALM's**, the **WoLLIC's**, other important academic events in Brazil, and other journals on logic and analytic philosophy.

We also make a brief survey on the research groups and centers dedicated to logic at several Brazilian universities and institutions.

[51] See (CARNIELLI and D'OTTAVIANO, 1999).

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