

Foreword

This issue of *Manuscrito* is the second volume of the proceedings of the *CLE/AIPS Event – Science, Truth and Consistency*¹, held at the University of Campinas (Unicamp), in Campinas, State of São Paulo, Brazil, during August 23–28, 2009, under the joint sponsorship of the Centre for Logic, Epistemology and the History of Science (CLE) of Unicamp and of the International Academy of Philosophy of Science (AIPS), based in Brussels. The meeting was meant as a tribute to the eightieth anniversary of Prof. Dr. Newton Carneiro Affonso da Costa, the pioneer Brazilian researcher in the areas of logic and philosophy of science².

The International Academy of Philosophy Science (AIPS) was officially founded on January 22, 1949 in Brussels, with the aim of promoting the intellectual cooperation of scientists and philosophers of different backgrounds, concerned with the synthesis of science, philosophy and theology, especially at a time when a demand for specialization was pressing universities worldwide. Among its founder members were not only scientists concerned with such synthesis, such as Bernays, Beth, Born, Bridge, Carnap, Church, Curry, Destouches, Frank, Gonseth, Heisenberg, Kleene, Kotarbinski, Pauli, Piaget, Poly, Popper, Sierpinski, Schrödinger, Whittaker, Wiener, Yukawa, but scientists creators of innovative new theories such as Einstein (relativity), Bohr (quantum mechanics), de Broglie (wave mechanics), Brouwer (intuitionism) and Fréchet (abstract sets and symmetric spaces). Since its creation, the Academy organized 50 regular meetings in various European countries, in the United States, Mexico

¹The first volume was published as a special issue of *Studia Logica* (2011), v. 97, entitled *The Legacy of Newton da Costa*, with a fragment of the contributions to the *CLE/AIPS Event*.

²Organizing Committee: I.M. Loffredo D'Ottaviano (Chair) for CLE; D. Mundici (Chair) for AIPS; W.A. Carnielli and M.E. Coniglio. Scientific Committee: E. Agazzi (Chair), O. Chateaubriand, D. Mundici, I.M. Loffredo D'Ottaviano, P. Suppes.

and Peru. The meeting of which this volume is part of the proceedings was the first one in Brazil. Evandro Agazzi is the AIPS president.

The Centre for Logic, Epistemology and the History of Science (CLE) at Unicamp, aiming at bringing together scientists from the various branches of scientific and philosophical knowledge, has promoted since its official establishment on April 7, 1977, more than a hundred medium and large size events. This CLE/AIPS meeting had the participation of scholars in the fields of philosophy, logic, epistemology, history and philosophy of science, their contributions being focused on issues related to da Costa's work, with emphasis on interdisciplinarity.

Newton Carneiro Affonso da Costa has known how to crystallize, in a series of logical calculations, the power of contradictory reasoning in science and philosophy.

Since his youth da Costa has been interested in issues of logic and the foundations of mathematics. Very motivated by his mother, Silvia Carneiro Affonso da Costa, and his aunt, Carmen Carneiro, with the support of one of his uncles, Milton Carneiro, then Professor of History of Philosophy at the Federal University of Paraná (UFPr), he started reading philosophy through French translations of the dialogues of Plato and texts of Aristotle.

In the years 1950 da Costa began to develop his ideas about the importance of the study of contradictory theories. In 1958, in *Notas sobre o conceito de contradição (Notes on the concept of contradiction)*, published by the *Anais da Sociedade Paranaense de Matemática (Annals of the Mathematics Society of Paraná)*, da Costa proposed the following *Principle of Tolerance in Mathematics: From the syntactic and semantical point of view, every theory is permitted, provided that it is not trivial.*

Conceived between 1954 and 1958, and presented in seminars and conferences at the Federal University of Paraná (UFPr) and at the University of São Paulo (USP), da Costa's paraconsistent calculi

show mathematically that contradictions can be profitably kept in theories and rational contexts that express knowledge. Moreover, his calculi were the first to bestow the formal tools needed for processing the contradictions that the new science, together with the old philosophy, were looking for. Half a century later, not only the philosophical debate but also information theory, linguistics, quantum physics and psychoanalysis make use of this intellectual tool.

Having presented his ideas at the meeting of the Brazilian Society for the Advancement of Science (SBPC) held in Curitiba in July 1962, da Costa published his first notes about inconsistent but non-trivial calculi in the journal *Ciência e Cultura (Science and Culture)* in the same year.

Beginning with his Thesis *Sistemas Formais Inconsistentes (Inconsistent Formal Systems)* da Costa initiates, in 1963, the publication of a series of papers in the *Comptes Rendus de l'Académie de Sciences de Paris*, in which he introduces his well known hierarchies of paraconsistent calculi. In *Sistemas Formais Inconsistentes*, the objectives of his pioneer work are clearly defined. He introduces his hierarchies of logical calculi 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 are devised to be maximally conservative over classical logic, in particular, Modus Ponens must still hold, and whenever the principle of non-contradiction ($\neg(A \& \neg A)$) holds for a formula A , then A must behave like a classical formula. A paraconsistent logic aims at accommodating possibly inconsistent pieces of information in a formal framework where useful deductions can be made.

Since 1964, da Costa's logics and paraconsistent logic in general have been attracting increasing interest.

Da Costa, his disciples and collaborators have introduced many paraconsistent systems, and have obtained original results concer-

ning the semantics and decidability of those calculi and a general theory of valuations, algebraic structures associated to such systems, paraconsistent set theories, logics of higher order, model theory, paraconsistent differential calculi and some recent applications to informatics, computer science, engineering, medicine and technology.

Several applications of paraconsistent logics have been developed, such as theories based on semantically closed languages, ethics, doxastic, deontic and epistemic logics, theory of probability, foundations of quantum mechanics, artificial intelligence, cognitive sciences, foundations of the infinitesimal calculus, foundations of science and its philosophical analysis.

One of the relevant concepts, formally and rigorously introduced by da Costa, is the pragmatic notion of *quasi-truth*, a notion that generalizes Tarski's correspondence definition of truth. *Quasi-truth* can be formulated by means of a wide generalization of standard model theory and is related to what da Costa calls "abstract Galois theory". For him the concept of quasi-truth is a reasonable truth concept inherent to the empirical sciences, in particular to physical theories. It can be shown that the logic of quasi-truth is paraconsistent and is reduced to classical logic when quasi-truth is identified with truth.

Da Costa taught at the Federal University of Paraná (UFPr), University of São Paulo (USP) and University of Campinas (Unicamp), being nowadays invited Collaborator Professor at the Federal University of Santa Catarina (UFSC), Brazil. Open and sensitive to new opportunities, Newton da Costa had an important role in creating the Centre for Logic, Epistemology and the History of Science (CLE) at Unicamp in 1976, and has remained up to date as one of CLE's most important and active members.

In 1977, da Costa conceived the creation of the Brazilian Logic Society (SBL), since then based at CLE, and was its first President. Further, in the 70's da Costa was also a major force behind the Latin-American Symposia on Mathematical Logic, sponsored by the Asso-

ciation of Symbolic Logic, of whose council he was a member during 1970-1973 and whose Committee on Logic in Latin-America he chaired during 1970-1976.

In 1982 he was the founding editor of the first international journal in the area of non-classical logics, *The Journal of Non-Classical Logic*, that was merged in 1991 with the *Journal of Applied Non-Classical Logics*, edited by Hermès/Lavoisier France.

His personal archives, donated to the Historical Archives on the History of Science of CLE, have been research subject for several students and researchers.

A man of political convictions, he never ceased to share ideas with his students, and had his share of difficulties during the rigid authoritarian period, in the last 60's and 70's, in Brazil.

Among the awards he has received during his career let us mention: *Moinho Santista Prize*, 1993; *Jabuti Prize in Exact Sciences*, 1995; *Ordem do Pinheiro Medal* of the State of Paraná Government, for scientific merit, 1996; *Scientific Medal of Merit "Nicolaus Copernicus"*, awarded by the University of Torun, Poland, 1998; *Scientific Merit* of the Federal University of Paraná/ Association of Former Students, 1998; *Emeritus Citizen of the State of Paraná*, for scientific merit. Da Costa is also a member of many academies, including: Honorary Member of the *Institute of Philosophy of Peru*, 1975; Honorary Member of the *Research Institute of Philosophy of the University of Lima*, 1980; Corresponding Member of the *Academy of Sciences of Chile*, 1982; Member of the *Academy of Sciences of the State of São Paulo*, Brazil, 1978; Member of the *International Institute of Philosophy* in Paris, 1989; and Honorary Member of AIPS.

In 1976, during the *III Latin-American Symposium on Mathematical Logic (III SLALM)*, held at Unicamp, the Peruvian philosopher and AIPS member Miró Quesada coined the term *paraconsistent logic* for expressing logics that could afford inconsistent but non-trivial theories; in 1984, the first two issues of volume 43 of *Studia Logica* were entirely dedicated to paraconsistent logic; in 1989 *Philosophia*

Verlag published the first encyclopaedic book on paraconsistency, *Paraconsistent logic: essays on the inconsistent*, by Routley, Priest and Norman; in 2000, volume 125, n. 12, of *Synthèse* was dedicated to Newton da Costa.

Since 1990, the item “paraconsistent logic” appears in the AMS Subject Classification. The series of meetings “World Congress on Paraconsistency” began in 1994 in Ghent, Belgium, followed by the second edition in Juquehy, São Paulo, Brazil, in 2000, dedicated to da Costa’s 70th anniversary; the third and fourth editions were held in 2003 (Toulouse, France) and 2008 (Melbourne, Australia), respectively.

The intense dedication of Professor da Costa has never been limited to scientific work. He has been also dedicated to the guidance of several students in Master Dissertations and Doctoral Theses, helping to form the first generation of Brazilian logicians. Among them are: Ayda Ignez Arruda (his first student and collaborator), Antonio Mário Sette, Elias Humberto Alves, Lafayette de Moraes, Luiz Paulo de Alcântara, Andrea M. Altino Loparic, Walter Carnielli, Tarcísio Pequeno, Décio Krause, Edélcio de Souza, Juliano Maranhão and Itala M. Loffredo D’Ottaviano.

His scientific descendants have occupied academic positions in several Brazilian institutions and in universities in Argentina, Colombia, Switzerland, Germany, France and the United States of America.

Da Costa has dealt with several domains, such as mathematics, the foundations of mathematics, logic and physics, in particular non-classical logics, relativity theory and quantum mechanics, focusing on philosophical topics such as the metaphysics of quantum field theory and the nature of the logic that underlies ethics. Yet in his own words, during the CLE/AIPS Event, “Although I have studied several fields of knowledge, my career as a researcher has a certain unity”, what has enabled him to “elaborate a modern conception of science and knowledge”...

“But the position I adopt is in constant change, trying to adapt itself to the evolution of science and knowledge in general. It is, as Hermann Weyl would say, an attempt to climb the heavens.

Perhaps this is the only admissible attitude, rationally speaking, of a philosopher or a scientist”. (*da Costa, Unicamp Professor Emeritus Ceremony*)

As of today, Newton da Costa has published around 250 papers, books, articles and notes. More than 3000 citations of his books and papers, in more than 10 languages are known. He has been visiting scholar in research institutions in the Americas, Europe and Australasia.

The magnitude and impact of da Costa’s work made him one of the most cited Brazilian scientists. Specialized meetings have been devoted, in part or in whole, to discuss and debate his work in Brazil, Belgium, Poland, United States, Canada, Denmark and Italy.

In a personal correspondence with da Costa, von Wright deemed paraconsistent logic as the best creation in logic during the second half of the 20th century, having changed the paradigms of logic.

The creative and innovative work of da Costa and his unquestionable academic leadership were crucial to the emergence of an internationally recognized “Brazilian School of Logic”.

We, the guest editors of this volume, are proud of being among his collaborators and friends.

The *CLE/AIPS Event* was attended by over one hundred members of the international philosophical scientific community, featuring CLE and AIPS members and former da Costa’s students and collaborators.

During the opening ceremony, hosted by the Rector of Unicamp, Prof. Dr. Fernando Ferreira Costa, the President of AIPS, Prof. Dr. Evandro Agazzi, announced that Newton da Costa had been elected an *Honorary Member* of the International Academy of Philosophy of Science, being the first Brazilian to receive so great honour.

The opening talk of the meeting was delivered by Prof. Agazzi,

on the subject *Consistency, Truth and Ontology*. During the event Prof. da Costa was awarded with the title of “Professor Emeritus of the University of Campinas”. This deliberation of the University Board was a fair homage to this intellectual and teacher who, with his example of work, dedication and ethical behaviour, has so much contributed to the development and academic quality of Unicamp and has so much ennobled the Brazilian Philosophy and Science. According to da Costa’s words, during the Unicamp Professor Emeritus Ceremony:

“Since I was 15 years old, I have nurtured a great interest for knowledge, with emphasis on scientific knowledge, which I have tried, step by step, to understand and unveil. This included not only formal disciplines (such as logic and mathematics), but also natural sciences, especially physics, and human sciences. It became immediately clear to me that, with such an aim, I should become acquainted with the formal sciences, for they constitute, as it were, the pillars of other sciences.

It is clear that such an aim needs to go hand in hand with a philosophical quest. Although it is possible to analyze science and its presuppositions without invoking a philosophical stance, the resulting analysis is incomplete and somewhat superficial. And those who lack familiarity with science, in turn, cannot develop properly a philosophy of science. Thus, I became seriously involved with both philosophy and science. Currently, a non-trivial philosophy of science can only grow via interdisciplinary studies, with the cooperation of specialists of different fields. I was then led, I repeat, to study and investigate various fields of knowledge, an activity that has been conducted by more than half a century”.

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This special issue of *Manuscrito* contains the papers of the members of AIPS and part of the submitted papers to the proceedings of the *CLE/AIPS Event - Science, Truth and Consistency*. A third book of proceedings is forthcoming, as a special issue of *Principia International Journal of Epistemology*.

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