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Dialogues on Logic, Philosophy, and Justice: Interview with Andréa Maria Altino Loparić

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Abstract

In this historical interview, Andréa Loparić presents us with memories of her personal, academic, and political trajectory, which are intertwined with important episodes of the history of Brazilian philosophy and logic, especially paraconsistent logic.

Keywords: Logic, history of logic, non-classical logics, paraconsistent logic, Newton Carneiro Affonso da Costa, Ayda I. Arruda, Elias H. Alves.

1 Preamble

The interview with Andrea Loparić that we now publish is part of research efforts that have lasted for more than ten years, on the history of paraconsistency and paraconsistent logic. Various results of this academic-philosophical-historiographic project have already been published, some in journals and volumes of international circulation, which the memorable interview with Andrea now joins.

It all started with the research that had a high point in Gomes's doctoral thesis in Philosophy, with the title *On the history of paraconsistency and da Costa's work: the establishment of paraconsistent logic*, advised by D'Ottaviano, which was presented at the Institute of Philosophy and Human Sciences (IFCH) of the University of Campinas (Unicamp), on December 2013.

Among numerous challenges, this doctoral thesis faced a pressing situation: how could one record the singular and personal memories of various characters crucial for the history of paraconsistency into a historiographic framework? It was stated, then, the necessity of constituting a documental oral and written archive of aspects that only the protagonists of the history of paraconsistency

and paraconsistent logic could know and live. We noticed that the conventional sources could and should be supplemented so the corpus of sources relative to the foundation and historic-theoretical establishment of paraconsistent logics was more complete. Thus, we proposed to consider the available oral sources and to elaborate new records, through interviews.

As part of the festivities of the 50 years jubilee of the creation of the University of Campinas, during the academic years of 2015–2016, the publisher Editora da Unicamp (Unicamp University Press) published the *Série Unicamp Ano 50* (*Series Unicamp Year 50*), a commemorative special collection of 50 new books. A book derived from Gomes's doctoral thesis, in co-authorship with D'Ottaviano, with the title *Para além das Colunas de Hércules, uma história da paraconsistência: de Heráclito a Newton da Costa* (*Beyond the Columns of Hercules, a history of paraconsistency: from Heraclitus to Newton da Costa*), was published in 2017, as the final volume of the series and, in co-edition, as the volume 80 of Coleção CLE, edited by the Centre for Logic, Epistemology and the History of Science (CLE).[1] The book is divided into two parts and includes three appendixes, the third of them with the title "Fonte Oral em História da Lógica Paraconsistente" ("Oral Source in History of Paraconsistent Logic"), with the transcription of seven interviews, selected from the fourteen interviews we had done with renowned actors of the history of paraconsistent logic.

Proceeding with our work, we will soon publish an extended and enriched English version of the book. In addition to new sections and chapters, as the result of our Oral History of Paraconsistent Logic Project, the new appendix "Records of the History of Paraconsistent Logic" will count with 50 interviews, most of them yet unpublished. In this sense, we have put an effort into interviewing central characters of the history of paraconsistent logic, hoping that the result to be presented contributes to filling in the gaps that could not be fulfilled by the usual written sources. In the new book, amongst the interviews, we count with the oral or written retellings of 10 Brazilian academics and 40 foreign scholars.

Here enters Andrea Maria Altino Loparić. Already in our work in Portuguese, she was included in the list of indispensable interviewees since she was one of the first disciples and collaborators of Newton da Costa. However, although she immediately agreed to grant us an interview, we were not able to get her contribution. Then, we had a good idea, we arranged to go to her house, to interview her in person. The meeting was rescheduled by her a couple of times, for various reasons, but we could, happily, set a date.

[1] Gomes, Evandro L. & Itala M. Loffredo D'Ottaviano. 2017. *Para além das Colunas de Hércules, uma história da paraconsistência: de Heráclito a Newton da Costa.* Campinas: Editora Unicamp. (Unicamp Ano 50 Series, 50; Coleção CLE, 80).

We went to Sao Paulo, to interview her in her apartment, on March 6, 2020, when the Covid-19 pandemic, already disseminated throughout the world, was only beginning to spread in Brazil. It was an amazing morning and afternoon, we talked a lot, we had lunch with her, "a little pasta", as she used to say.

The interview was fantastic. Andrea told us about her family and friendships, her teenage and young years in Recife, her intellectual pursuits, and her political activism, since her youth. She told us about her undergraduation in Philosophy in Brazil, her graduate studies in Belgium, her initial struggles with the French and German languages, her relationship and marriage with Željko Loparić, and her interests and challenges in her first logic course. She recounted to us her return to Brazil, with Željko, her first teaching experience in Paraíba, and her participation in the logic event held in Brasília, in 1972, where she met Oswaldo Porchat Pereira. Then, she told us about Porchat's invitation to the Department of Philosophy of the University of São Paulo (USP), where she started her collaboration with Newton da Costa and, later, to the Department of Philosophy of the University of Campinas (Unicamp).

In a very interesting part of the interview, altogether friendly and pleasant, Andrea narrated to us her holiday travel to the United States of America, when she personally met Willard van Orman Quine and Nuel Belnap, two of the greatest North American logicians of the twentieth century.

Andrea's interview, as one the most significant representatives of Brazilian female logicians, will be published in our next book. However, we consider relevant the publication of this expressive and spirited interview in this volume, in her homage, so that we may express and reproduce the spontaneity and the strong and sweet personality of our friend Andrea.

In that lovely Friday, we acquainted that she was facing healthy problems, bravely struggling to recover and keep wellness, in spite of all difficulties that Covid-19 pandemic will be to impose over all of us.

The interview was narrated in Portuguese and was translated into English by William A. Pickering soon after. In fact, both versions of it were checked and approved by Andrea herself. In what follows, we now share with you, this magnificent statement for life, of love for truth and justice.

2 The interview

ELG *How did you begin your studies in logic?*

A. Loparić Well, I majored in philosophy. But I did my degree in philosophy with the idea of becoming more mature, because I didn't know what I wanted to do. I've always loved math. I was an excellent math student in high school, but also excellent in Portuguese. I liked to write and I liked all the subjects, so

I didn't know what to do. I only took the entrance exam for the second session, because in the first session I was unable to decide upon a course. Then in the second session, I said to myself, "I'm going to do philosophy, so I can mature". [laughs] During the philosophy course, one of the subjects that I really liked was logic, which was Aristotelian logic. I missed math very much because there was a big chance I was going to major in math, but I didn't. I didn't, because I was interested in politics. That is another side of the story—I even thought about law.

IMLD *I understand perfectly. Did you like the undergraduate course?*

A. Loparić I liked the undergraduate course and was a tutor in ethics. In ethics, I had a very interesting course on the theory of just war. At that time it was a hot topic for us, whether or not we would go to the armed struggle. What saved me from going to the armed struggle was that in this course I reflected on the doctrine according to which one of the requirements for a war to be just was the possibility of victory. If you were not able to show that you had a chance to win, you could not make war, because you would be sacrificing lives to no avail. And that was what saved me, because I didn't think we could justify the possibility of victory. Our strength was, as it is today, very small compared to the strength on the other side. So I went to Louvain to study more philosophy, to go deeper, and it was there that I took a course in symbolic logic with Joseph Dopp.[2] This was the first course in contemporary logic that I took. I was a lazy student in my first semester there. My father had died suddenly and I was kind of upset—not kind of, I was really upset. And that was also when I started dating Željko, and then I started to miss classes. [laughs] So on the eve of the test I was enchanted by logic, but I didn't have the skills. The result was that I almost didn't pass because of logic. There in Louvain, you don't fail a subject; the teachers get together and make a decision about the student's performance in all subjects... It was the other disciplines that saved me...

Three years later, we went to study in Germany, in Heidelberg. [Ernest] Tugendhat was reading Quine's *Methods of Logic* in a course I signed up for. There I did really well, I even stood out, because there were things he didn't understand that I understood, so I went to the board and explained them to him. Balthazar [Barbosa Filho] liked to tell that to everyone; he arrived in Heidelberg when I had already left, but he was told the story of the Brazilian who had done this. After the course with Tugendhat, a friend who studied logic at Berkeley came to visit and said, "Read Benson Mates". Then I started

[2]Dopp, Joseph. 1950. *Leçons de logique formalle.* Louvain: Éditions d'Institut Supérieur de Philosophie. 3 vols.

to study Benson Mates' book[3]. At the end of 1968, I went back to Brazil. I was in Recife looking for work, when I learned that in Paraíba they needed a professor of logic in philosophy. Very few people had had any basic training in logic at that time in Brazil, in the Northeast then hardly anyone. I went there and became a professor of logic at the [Federal] University of Paraíba. I took Benson Mates' book and went to teach it as a textbook. I remember I was alone, I had no one to discuss anything with or to ask for help. We spent almost four years in João Pessoa.

In 1972, Fausto Alvim from Brasília sent an invitation to Antônio Mário Sette for the logic seminar, the first Latin American logic seminar in Brazil, which he was organizing in Brasília. Fausto asked Antônio Mário if there was anyone else in the Northeast interested in logic. So Antônio Mário sent a message to me, "Oh, Andrea, there is a guy who is organizing a seminar there, don't you want to go?"

IMLD *Antônio Mário was from the department of mathematics?*

A. Loparić He was from Pernambuco, from the Federal University of Pernambuco. I taught in João Pessoa, Paraíba, one hundred kilometers from Recife, about as far as from São Paulo to Campinas, very close. But Antônio Mário and I had known each other since we were children, and he knew that I was teaching logic classes. I replied that I was interested, and Antônio Mário told me to get in touch with Fausto Alvim. Then I wrote asking Fausto Alvim if there would be any facilities like hotels for anyone who went. He sent me a ticket and full accommodation for a month, so I went. I had a course in model theory with a very good American professor, Abraham Robinson, and a beginning course with Porchat... He gave a beginning course in logic to those who knew nothing about it, because there were people there, who had never done anything in logic, who said "I want to go" when Fausto called. He had an entire floor in one of those official buildings in Brasília to host everyone, and everyone stayed there. So I started taking the model theory course and there was a lot of mathematics, a lot of mathematical models, so I started not being able to follow because I hadn't taken an algebra course. But I was listening to some classes, trying to "educate the ear" at first. There I met and became friends with Iole Druck. Chico Miraglia was also in that course. It was also there that I met Porchat.[4] At night he went out with us to drink beer. At

[3]Mates, Benson. 1965. *Elementary Logic*. New York: Oxford University Press.

[4]Oswaldo Porchat de Assis Pereira da Silva (1933–2017) was an important Brazilian philosopher. He majored in classics at the University of São Paulo (1956) and obtained his doctorate in philosophy at the same university with the thesis "The Aristotelian Theory of Science" (1967). He studied with Victor Goldschmidt and Martial Guéroult. Porchat was a professor at the Faculty of Philosophy, Letters, and Human Sciences at USP and emeritus professor at Unicamp, where he led the foundation of the Department of Philosophy and

the end of the month Željko arrived, and it was then that we got Porchat's invitation to come to USP [University of São Paulo]. So the following year we left João Pessoa and came to the Philosophy Department at USP.

ELG *Was this at the time when he was already thinking about founding a Center for Logic? Was he back from Berkeley yet?*

A. Loparić This story I know and I can tell you. It was as follows. We came to USP in March, 1973, Željko as professor of philosophy of science and I as professor of logic. Porchat had two "assistants", who were Luiz Henrique [Lopes dos Santos] and I. So we both went to teach the undergraduate course and shared the course. I gave the technical part and Luiz Henrique gave the philosophy of logic part. As there were 80 students altogether, and the classes lasted for four hours with an interval in the middle, we decided to divide the students into two sections. In the first two hours, he taught philosophy of logic in one section, while I taught logic from Benson Mates to the other section; then we changed classes and did the same thing for the remaining two hours. I only stayed at USP for three years at that time, because there was a big divide in the philosophy department. The teachers of logic, philosophy of science, and analytical philosophy were denounced as neopositivists. At the same time, Rogério Cerqueira Leite was asking Porchat to move to Campinas and found the Department of Philosophy and the Centre for Logic [Epistemology, and History of Science at Unicamp].

IMLD *We have an interview with Porchat in which he states that he initially tried to create a center of logic, epistemology, and history of science at USP, and that USP did not want to do it.*

A. Loparić This is true. He tried and had no support. So Rogério said, "Then come to Campinas". They talked about it, they were friends, and Porchat called some people. In fact, he called Luiz Henrique and Carlos Alberto [Ribeiro de Moura, USP], and then Carlos Alberto said that he wanted [Luiz Roberto] Monzani to go along. I had already started working with Newton then, and Newton had spoken well to Porchat about me. So I told Porchat that I wanted to leave USP, because the environment was very heavy, very bad. Newton supported this, and Porchat asked me to come along. So I was part of the group that left the USP department. It was a tragedy, because the

the Centre for Logic, Epistemology, and History of Science (CLE). In the creation of CLE, Porchat was inspired by the Group in Logic and Methodology of Science at the University of California (Berkeley), which brought together names such as Alfred Tarski, Leon Henkin, Robert Vaught, Benson Mates, and others, with whom Porchat associated during a post-doctoral fellowship. Oswaldo Porchat elaborated a sceptical philosophical position known as neo-Pyrrhonism.

people at USP did not imagine that we would leave. They didn't imagine it at all. And so it was that I went to Campinas.

IMLD *You know countless personalities in logic, philosophy, and mathematics in the 20th and 21st centuries. Which one was most inspiring to meet?*

A. Loparić I have a very vivid memory of a very picturesque situation where I met famous people who were extremely friendly. In 1971, Željko and I traveled from London to Boston, and our bags did not arrive on the same plane. The airline accommodated us in a room, together with another couple who were waiting for their dog, and a tray with a bottle of whiskey, a bottle of Bourbon, and a bucket of crushed ice. A few hours later when the bags arrived, there was nothing left in the bottles or the bucket... The airline had taken care of everything for us, housed us in a hotel, and it was there and in that state that it occurred to me that we were in the land of Quine! With the courage that only whiskey guarantees, I took the phone book that was in the hotel room and went looking for the letter 'Q', Quine... Willard... Orman... and there was the phone number for Quine's house! I picked up the phone and dialed the number. A male voice answered, and then I said in Portuguese, "I would like to speak with Professor Quine". On the other end of the line, Quine replied, half-babbling, in Portuguese: "Yes, Quine here". I told him that I was Brazilian and a logic teacher, and that I would love to meet him. This all in Portuguese, because, above all, my English was very poor. He answered me in rusty Portuguese, "Then, tomorrow, 11 o'clock, in my office at the university". The university was Harvard... The next day, with quite a hangover, we went. He welcomed us very nicely and introduced us to many of the professors in that famous department, his fellow philosophers, who were very also welcoming to us. On that occasion, we met Nelson Goodman and Hilary Putnam. [Oswaldo] Chateaubriand, who was a tutor there at the time, then told us, looking very injured (and rightly so...), "I have been here for two years and have never been able to speak to Goodman"... And Quine did even more. Upon learning that we intended to visit philosophy departments at two other universities, Pittsburgh and Notre Dame, he wrote us introduction letters to colleagues in those departments. And so we had contact with a number of important people in 20th century logic and philosophy. Thanks to Quine's recommendation, we were received in Pittsburgh by Belnap and Anderson. Both were extremely kind. Belnap gave us a number of books to take back to Paraíba, books on logic and philosophy of science that he had duplicates of. At Notre Dame, Alberto Koffa welcomed us and we became friends. Unfortunately, he passed away at a very young age.

IMLD *And what were you doing in Notre Dame?*

A. Loparić We went there just to see it, to visit, for academic interests

too, but on own account. We were paying out of our own pockets, taking a vacation.

IMLD *And you had already finished your doctorate?*

A. Loparić I had no doctorate, I had the master's degree I did in Louvain. I was a professor of logic in Paraíba, and Željko taught philosophy of science; we hadn't even made contact with [Hugh] Lacey yet. It was after that that we made contact with Lacey.

ELG *Did Newton da Costa play a relevant role in your career and vocation for research?*

A. Loparić In fact, I think I've become somewhat more than a logic teacher because Newton made me do research. This I owe to Newton. I wouldn't have had the idea that I could do research if he hadn't had confidence in me and started giving me problems to solve. I met Newton at the event in Brasília, but that was just a quick contact. It was when we were already at the Philosophy Department at USP that Newton, who was in mathematics, asked Porchat if there were people from philosophy interested in logic, and Porchat told him about me. I remember that Newton came to my room and said, "I am a catechist of logic, so I go about, as Jesus Christ went about to catechize, I go about to bring people to logic". It was then I started to attend to mathematics. I had already met Iole and Chico Miraglia in Brasília, and then I met Jacob Zimbarg, Carlos Alberto Knudsen, Tsu, and a few other post-graduates from the group that was doing logic at IME-USP. I then started to work with Newton. Shortly after, in December 1975, we went to Unicamp to found the philosophy department and the logic center.

IMLD *Wouldn't it have been to found the logic center, as Unicamp's philosophy department came into being later? The logic center was already functioning when the department was founded, wasn't it? Wasn't that Porchat's work?*

A. Loparić Although it was founded later, the Department of Philosophy was also being founded in other ways at that time. So much so that Balthazar [Barbosa Filho] had already been invited by another group that wanted to found the philosophy department. Balthazar had been called by the group more centered on political philosophy, which included Nelson Boeira, Luís Orlandi, and the two Rubens, Rubem Alves and Rubem Cezar—the latter soon left for Rio de Janeiro. Then the group from the USP philosophy department, led by Porchat, came. Porchat's group included Luis Henrique, Carlos Alberto, Balthazar, Monzani, and me. At that time I had already obtained the semantics for C_ω, that came out in a note in the *Comptes Rendus de l'Académie des Sciences de Paris*, sent to the Académie by Marcel Guillaume at the request of Newton. I became very close to Newton at that time, I worked with him a lot,

and the friendship became very close for many years. I was so close to Newton that I was the one who brought him the news of Ayda's death [Arruda].

ELG *Your contribution to the development of a semantics of valuation for the C_n paraconsistent logics is very important. How did the first results come about?*

A. Loparić The idea of a general theory of bivalent valuations, as well as its first formulations, as found in the article "Paraconsistency, paracompleteness and valuations"[5], arose from my work in solving the problem of C_ω. Newton had obtained, along with Elias Humberto Alves, a bivalent semantics for the calculus C_1. When I joined the group, the result had just been obtained, according to Elias, with some hints from a Polish logician, Dubikajs, who was spending some time at IME as a visitor. From there, they proposed an extension of the semantics for C_n, $n < \omega$. Ayda Arruda, who was studying the possibility of extending this semantics to C_1 of the first order, was the one who told me about the difficulty of extending it to C_ω. The difficulty was attributed to the fact that C_ω did not have strong negation, which, it was thought, hindered the obtaining of maximal sets by means of the Lindenbaum lemma, making unfeasable the standard way of proving completeness. It was then that I started to study C_ω, and that was when I discovered that, contrary to what was usually thought at the time—this was at the end of 1975 or the beginning of 1976—the demonstration of Lindenbaum's lemma for any calculus depends only on the properties of the definition of deduction used in that calculus.

Take a calculus where the deducibility relation has the classical properties, namely: 1. Every formula that belongs to a set is deducible from it; 2. If a formula F is deducible from a set Γ and every element of Γ is deducible from a set Δ, then the formula F is deducible from the set Δ; and, finally, 3. If a formula is deducible from a set, then it is deducible from a finite part of that set.

When these three properties are valid for the concept of deduction used in the calculus, then the Lindenbaum Lemma is valid, i.e., we have that: If from a set of formulas a given formula is not deducible, then there is an extension of this set that is maximal with respect to such property I started to use an idea similar to, but not identical with, that of non-triviality (which was no longer dependent on the existence of a strong negation in the system). Non-triviality is the property of a set of formulas when from it not everything follows; and the concept we use is that of the property that has a set such that if a particular formula F is not deducible from it, but if any formula

[5]Loparić, Andrea & da Costa, Newton C. A. 1984. Paraconsistency, paracompleteness and valuations. *Logique et Analyse* 106: 119-131.

that was outside it is added to it, then the formula F is deducible from the resulting set. In the construction of the lemma, the set will then be extended by adding only formulas that retain unaltered the characteristic of not allowing the deduction of the specific formula F. The mention of formula F appears even in the name we use for maximal sets: "F-saturated sets". It is a concept that is close to, but distinct from, that of the non-trivial maximal, as non-trivial maximals are F-saturated for any formulas that do not belong to them; but with the F-saturated sets we leave open the possibility that, in some calculi, an F-saturated set is not G-saturated, for some G that does not belong to it. It was by using this concept that we constructed the proof of the completeness of C_ω with respect to the valuation semantics that we proposed, without the use of a strong negation, because C_ω has no strong negation.

IMLD *It is the only system in the C_n hierarchy that does not have it.*

A. Loparić Then I thought, now we can generalize, because what will depend on the specific laws that apply in the calculus will only have importance in the semantic lemma, in the second part of the proof of completeness, which is where you say how this set is F-saturated, what necessarily belongs to it, what has to belong to it if another formula belongs to it, and why the axioms and rules of the calculus itself will matter. But you get the F-saturated set in an abstract way, without depending on the laws of the calculus! And it proves at that moment that, in an F-saturated set, the notions of relevance and deducibility are coextensive. Everything that is deduced belongs, and everything that belongs is deduced. And this you prove from the definition of F-saturated set: the set has this property with respect to F if it is not deduced from it, but F is deduced from any set that results from it when we add any formula that is outside of it. With this definition, it is easy to prove that relevance is coextensive with deducibility in these sets, regardless of what the calculus is. So, if you take the characteristic functions of these sets, then we have the best candidate for the concept of valuation. At that time, it was not thought to define valuation like that. It was at that moment that it seemed to me that this was the best understanding of what a bivalent valuation should be. A valuation is the characteristic function of a set of this type, which is nothing more than a maximal theory. There syntax and semantics come together. We can then understand why it was from the understanding of what was essential to Lindenbaum's Lemma that the idea of valuation theory was born. Because there being maximization of sets that are consistent in any calculus with the above-mentioned deducibility properties, or, that is, there being always maximal theories in such calculi, then there will be bivalent valuations for them, namely, the characteristic functions of their maximal theories. Then I went to Newton and said, "Newton, we can create a general theory of valuations".

He didn't answer me at the time, because, I imagine, he also must have been thinking of something similar, only it wasn't based on maximal theories. The definition given to valuations before my proposal was one that saw a valuation for a calculus as a function of its formulas in $\{V, F\}$ that assigned V to the axioms, that preserved V in the rules, and assigned F to at least one formula—what in my article with Newton became an "evaluation". If I'm not mistaken, this is how valuations appear for the predicate calculus in an article by Ayda. It was in my article with Newton that we established the word "valuation" for the characteristic functions of maximal theories. My next step was to address the general question of when a maximal theory is an inductive set. When it is, you immediately have that the calculus is deducible. One way to show this is by giving an inductive definition of valuations. And that is how I always worked, with a view to decidability. My doctorate is a reflection on this topic.

ELG *Without a doubt, this was a great result, a great generalization.*

IMLD *In fact, it is very well known that based on the work on C_ω, a general theory of valuations can be created for any system, it does not even have to be paraconsistent. I've always heard that valuation theory is something that came from you, and that its creation was yours. And there is Elias [Alves]'s article, there is yours, and your general article with Newton. When it is mentioned, one always speaks of Andrea Loparić. You remember when Wójcicki came to Unicamp, I was a student then too, and you used to teach in the philosophy department and I in mathematics. He gave us a course that was about the book he was preparing. The classes that Wójcicki gave us were part of that book on consequence relations, that book of 1988.*[6] *He tested the book's ideas in the course he gave us at IMECC.*

A. Loparić I was very unhappy, because what Wójcicki was saying there was very close to what I was doing, and I was kind of discouraged. I said: "There's no use going on with this, there are already people doing it, etc." He even told me that he had a group of twenty people around him working in that direction, while I was alone...

IMLD *He studied the consequence relation.*

A. Loparić Exactly.

ELG *When was your first contact with paraconsistent logic?*

A. Loparić Ah, that was earlier. I remember perfectly, exactly, one day at the Mathematics Institute here [at USP], before we went to Campinas, when

[6] Wójcicki, Ryszard. 1988. *Theory of Logical Calculi: Basic Theory of Consequence Operations*. Dordrecht: Kluwer Academic Publishers. (Synthese Library, 199) [2013. Springer Science+Business Media, B. V.]

Newton gave me the semantics of C_1 to read in a typewritten copy... I thought it was crazy because I only knew of classical negation, so I thought it was completely crazy; where have the value of A and of its negation, $\neg A$, been seen to be both true at the same time? I went three days without understanding it, but saying to myself, "It can't be nonsense because, after all, there are serious people thinking this". Eventually I understood it, and I drew from it something that I have defended my whole life, which is the way I understand paraconsistent negation. Paraconsistent negation does not invalidate, derogate anything, it is something else. It is a modal operator.

IMLD *Not necessarily modal. It is an operator.*

A. Loparić It is modal in the broad sense of the word; it has something in common with negation, but it is another operator. In other words, it is related to negation, but it is something else. It is not in any way a rival of classical negation. Intuitionist negation is a rival, because it does not coexist with, does not subsist together with, classical negation; it dies when classical negation enters the picture. The two do not share the same arena. Paraconsistent negation divides the arena with classical negation perfectly, they live together. So they are different, but one does not finish off the other.

IMLD *I think they can be called negations, but they are different approaches.*

A. Loparić It is for this reason that I think that saying that it overrides the principle of non-contradiction is not very suitable. It has other behavior, so I don't see any problem.

IMLD *What is interesting is that for certain theories, including practical, empirical ones, paraconsistent negation is more appropriate than the classical one.*

A. Loparić There are things that we want to say using paraconsistent negation, and there are things that we want to say using classical negation. It is simply another entry in the dictionary.

IMLD *Yes. I think one doesn't need to say that it is a modal operator. I think they are distinct operators of negation.*

A. Loparić It is modal in the broad sense of the word "modal", that is to say, intensional; it is in that sense. For example, if you want two statements, one without and the other with a negation, to be valid at the same time under the same aspect, then it is not the classical negation you are using, because if you want to do this with the classical negation, you are saying something asinine. This is what Aristotle says, you see, and that remains so forever, amen!

IMLD *Which does not mean that you always need this negation.*

A. Loparić It doesn't mean that it is the only thing you can say, that you can't say something else; there are other things you can say. For example, when I say, "I want to and I don't want to", it is not that I want to and I don't want to at the same time. No, it is not. The action of wanting is one, and the action of not wanting is another. So much so that sometimes I go here, sometimes I go there. If I go here and go there, it is not at the same time. So this "no", "I want and I don't want", this "no" is not classical. This "no" is a paraconsistent "no", which is weaker.

ELG *You said you met Newton da Costa for the first time in Brasilia. What could you say about his importance for your career and about his role in logic in Brazil?*

A. Loparić Well, I'm a researcher thanks to him; it was Newton who made me become a researcher. I went a large part of the way with him, you know, and I owe this to him, without a doubt.

ELG *Do you remember some memorable occurrence involving Newton da Costa and his colleagues at that time?*

A. Loparić Ah, there would be many. You see, I worked with Newton for more than ten years, and very closely. So I don't know exactly what you want to hear. It was Newton who told Porchat that I wanted to go to Campinas, and it was Newton who made effective my going to Campinas. He wanted me to be a full professor, he wanted me to make a career. And if there's one thing I'm not, it's a careerist. That, I think, must be my Catholic roots, very strong.

ELG *And with regard to Ayda Arruda, have you anything to recall?*

A. Loparić I'm sorry I didn't have greater contact with her and a closer friendship, because I respect Ayda, I do respect her. In the beginning, Ayda opposed my going to Campinas because I didn't have a recognized master's degree. I did a course there in Louvain that they didn't recognize as a master's degree here. Everywhere in the United States it was recognized. When I came here [USP], I left a position of full professor, I had that title in in Paraíba, and went to become a teaching assistant, earning half of what I earned before. But I wanted to... at Unicamp I was an MS2, because at Unicamp everyone was paid as an MS2.[7] So Ayda was opposed [to me coming there]. In the beginning, I saw Ayda as a person who did not like me who, anyway...

IMLD *The truth is, she liked you.*

A. Loparić I learned that later on. At first I felt that way, but then it gradually got better. I could see that that was not the case.

[7]MS2 is a stage in the career of a professor of higher education in the public university system of the State of São Paulo.

IMLD *I was with Ayda until she died, I stayed in her apartment, I went with her to the hospital, and was there when she died. I had never seen anyone die, it was a terrible thing. Ayda was an admirable person, very correct, very serious, pure, a very straight person, she didn't back down, she was tough. You know, she was a person who really was a student of Newton, and she was very dedicated to him. She organized everything for him and did everything for him.*

A. Loparić Days before she died, I had arranged with [Antônio Mário] Sette that he would call me when the end came and that I would let Newton know. And so it was that after he called, I got the car and went over to Newton's house to break the news.

ELG *What can you recall about Elias Humberto Alves?*

A. Loparić Elias was a dear, a great friend. I liked Elias very much. He was my friend since the days when I started working with Newton. That's when I met Elias. He was a sweet person, he was a good person, a thoroughly good person.

IMLD *He was a good teacher, he did everything he could for everyone who came near him, student, colleague, staff. He didn't have a bad word. And when we fought, or if some of us took different positions, Elias was never on one side or the other. He always ended up pleasing both sides and trying to get everyone together. And he was good to the students. After he passed away I heard about it. There was a student who arrived in Campinas, who had no place to stay, and he took him to live in his house for a while.*

A. Loparić He was a kind person, Elias was a kind fellow.

IMLD *I know a story about Andrea that she can't imagine, a fantastic one. I think it was at Monzani's doctoral defense, I'm not sure. Andrea made a vatapá in her apartment, in her house. Didn't you?*

A. Loparić I made a lot of *vatapás*[8], I don't know. [laughs]

IMLD *Then that was the famous one.*

A. Loparić Monzani's doctorate? I don't remember.

IMLD *The way I know about this story, it wasn't Maria Inês who told me, as Maria Inês, Elias' wife, was always a very special woman. She was the only person who could live with Elias, because he was so nice; nobody could stand being his wife, with that kindness, being totally on the moon. And Maria Inês, she accompanied Elias, did everything for him, and she would not tell this kind of story. In any case, she had invited Ayda Arruda to lunch at her*

[8] *Vatapá* is an Afro-Brazilian dish that is very common in the north and northeast regions of Brazil.

house. And like everyone else, she liked Ayda, but everyone took a certain care, a certain ceremony with Ayda, because she was very discrete, she was very formal. Ayda wouldn't converse like we are now, she wouldn't talk, she wouldn't answer certain things. And Ayda went to Maria Inês's house to have lunch, it was on a Saturday. Only Elias was not there; he had not arrived, and he did not arrive. He was supposed to have arrived earlier or on Friday. Well, it was Ayda who told me this story, and Ayda was a friend of mine and would tell me things and I would die laughing. Anyway, this thing couldn't be ignored; nothing from Elias. Suddenly, Elias arrives home—I'm getting to the end of the story—Elias arrives at the house, knocks on the door, and Elias is late, or something. And Maria Inês says: "Elias, how is that you are arriving now Elias? What is it, Elias, what happened?" Then Elias replies, "No, no, Inês, you know there was party yesterday at Andrea's". But he was supposed to go to the doctoral defense, go the party at Andrea's, and come home. "There was a party yesterday at Andrea's". "I know Elias." Then what? Ayda says Maria Inês was quiet, there was no argument, there was no fight. Then Maria Inês looks at Elias and says: "Elias, whose glasses are those?", "Elias, whose glasses you wearing?" She says that Elias takes off his glasses, and puts them on the table. "Oh, Maria Inês, thank God. I don't know whose they are, but I'm glad they're not mine. You can't imagine how bad off I was; I could hardly walk. I arrived at the bus station and I couldn't even see the stairs in the bus." That was the story that Ayda told me. He arrived, took off his glasses, said "That's good, I didn't know... ", they had lunch, Ayda left, and on Monday she told me the story. What happened was that there had been a party at Andrea's, who had made a wonderful vatapá, and they drank a lot. Elias slept at Andrea's house, and she didn't even know that Elias had slept there... Did you know that story?

A. Loparić No, I don't remember that one. But sleeping at my house was normal, on the couch in the living room.

IMLD *That day, he said, Andrea went to sleep and everyone was having a roaring good time, everyone was friends, friends of philosophy. I think Monzani, or someone who was a friend of yours, had defended his doctorate, and Andrea had made the famous vatapá, and everyone wanted to eat vatapá. As it turned out, they all had gotten drunk, Andrea went to sleep, and Elias fell asleep on the living room sofa or on the floor. He woke up, very nervous when he saw the time, because he knew he had an appointment to have lunch, and Maria Inês had already called. So, very nervous, he took his glasses and left.*

ELG He grabbed the first glasses he could find.

IMLD *He took his glasses and left, he took the ones he thought were his. And he said he couldn't see, that he couldn't walk, he couldn't climb the stairs...*

A. Loparić And he didn't know it was because of the glasses. [laughs]

IMLD *He thought it was from drinking, from the party, from the vatapá. When Maria Inês said, "Whose glasses are these?" Elias said, "Blessed Maria Inês, you solved my problem." The glasses were not his. It was a while before you found out whose glasses they were, because he had to go to your house, leave the glasses, and find out where his glasses were. So it took a while for him to get his glasses back. The others were not his, but belonged someone who had left them at the party. Someone must have taken his. For me, this story about Elias was good one. When we talked, I always asked him, "Elias, whose glasses are these?" I didn't know that you didn't know this story...*

A. Loparić No, I didn't know that one.

ELG *Did you work together to elaborate the semantics for the C_n, $n < \omega$ hierarchy?*

A. Loparić Yes. The first semantics of C_1 was done by Elias and Newton, with a touch of Dubikajtis. Then they extended it to C_n, $n < \omega$ as they understood it.

IMLD *They extended it to C_n; and when they arrived at C_ω, did they see that it was wrong?*

A. Loparić No, no. That of C_n was wrong for n greater than 1. I saw that there was a mistake, and I called Elias, and then we made the correction, and wrote and published it together.[9]

ELG *Do you remember the SLALM at Unicamp in 1976, where Miró Quesada proposed the name "paraconsistent"?*

A. Loparić I remember. Yes, I remember.

IMLD *Yes, I also remember his lecture. He proposed it there, but he had already agreed on it with Newton da Costa; he had proposed the name to him a year earlier in the letter that is published in the appendix of this book.*

A. Loparić I was going to present a paper at that event about the C_ω system. What happened was that Chuaqui tried to read it, but he didn't understand it because I was only then starting to write about logic and I wrote it without giving any helpful explanations. I wrote only the results, and proved every step, but did not give any intuitive hints.

IMLD *Chuaqui was very good, but he didn't understand paraconsistency; he didn't get what is behind it.*

[9] Loparić, Andrea & Elias H. Alves. 1980. The semantics of the systems C_n of da Costa. In *Proceedings of the third Brazilian conference on mathematical logic*, 161–172. São Paulo: Sociedade Brasileira de Lógica.

A. Loparić And I used the decision method with ones and zeroes, etc., the tableau, the step by step construction, with millions of variables in the tableau, and so on. So Chuaqui justly said that he did not understand it, and that gave me a bad feeling. They advised me not to publish it, because that way of writing would get me heavily criticized, they said. I was very young, and I think I was afraid that I was wrong; and it wasn't wrong, it was right.

IMLD *That event, the Latin American Symposium on Mathematical Logic, the first here in Campinas, had very good people. There was Solovay, Joseph Shoenfield, López-Escobar, and Chuaqui himself, who, aside from being a charming friend, was very good.*

A. Loparić He was.

IMLD *There were very good people at that event. It was the first time that Unicamp hosted people in logic that were of such great relevance in the field.*

A. Loparić No, Tarski had come before, in August of 1975. It was before I arrived in Campinas, because I arrived in December of 1975.

IMLD *Definitely, Tarski came before, but it was not at an international event with other guests.*

ELG *What motivated you to work with paraconsistency?*

A. Loparić What motivated me was the challenge that Ayda Arruda gave me, to do the semantics of C_ω and prove its completeness. C_ω was a challenge. I like challenges a lot. Newton had given me things to work on from Grothendieck, Grothendieck universes, in category theory. I did a little work for him on that which was never published, and that he liked, etc., but I never knew what happened to it. But then when Ayda brought me this challenge, it got easier, in a way. It was easier, especially after having found out the crux of the matter.

ELG *What do you think about the reception of paraconsistency in the academic world?*

A. Loparić I don't know, my dear; I don't follow it anymore. After that I stopped work with paraconsistent logic. The last things I did were with [Richard] Routley. Then I started working on predicate calculi and other things, on predicate calculi with more than one universe, and working with formal elements in psychoanalysis, things like that.

IMLD *Talk a little bit about Routley, because no one has had contact with him.*

A. Loparić I worked with him on paraconsistent relevant logic. I did two articles with Routley. One was about a system that was Ayda's. We made a

semantics for extensions of a system that is a lattice, which is also a relevant system; it is very weak, a very weak implication, a relevant implication. We also developed semantics for them and for some extensions that Routley had done. This was when he came to Brazil, and then also by correspondence; the second article was by correspondence. And there is a chapter of mine in *Relevant Logics and their Rivals*[10], Volume 2—I was one of the editors along with his team—and this chapter appeared in my name. I sent the material written by hand in pencil, and there they rewrote it and put it in my name.

ELG *Because Routley passed away prematurely, few people have talked about him, and even Australians speak little of him. If we follow the historical development, however, we can see that he is a very important character. In a way, with regard to the Australian School, it all starts with him and Bob Meyer. Meyer, at first, seems to have been more interested in relevant logic, but Routley was always been interested in paraconsistency, along with relevant logic.*

IMLD *Do you think we can think of anyone as the creator of paraconsistent logic?*

A. Loparić Well, I think it was Newton [da Costa]. Anyway, it was who showed up and signed for the thing... He who raises the child is the father. [laughs]

IMLD *How do you evaluate the dialetheism proposed by Graham Priest, who claims that there are real contradictions?*

A. Loparić I disagree with it, I don't find it interesting.

ELG *The impression we have, because we have interviewed a lot of people and we see people's reaction at events, is that the insistence of dialetheists on their theses is doing a disservice to the paraconsistent project. It dissipates people's interest in studying paraconsistent logic because they find dialetheism unfeasible.*

IMLD *I have attended Priest's lectures, and in one of them he discusses the paradox of the liar as an example of a real contradiction; and for each example he presents, you can think, at best, of an epistemic example. I don't know what he means by "there are real contradictions".*

A. Loparić Look, it's so... this is silly to me. There is no contradiction in reality because contradiction is between sentences. [laughs]

IMLD *Last December, at the event in honor of Newton's ninetieth birthday, someone asked Andrés Bobenrieth a question, and he answered in Spanish,*

[10] Sylvan, Richard [Routley], Andrea Loparić & Val Plumwood. 2003. The More General Semantical Theory of Implication and Conditionality. In *Relevant Logic and their Rivals.* Edited by Ross T. Brady, vol. 2: 141–191. Aldershot – Burlington: Ashgate.

"What is this nonsense? You ask me if there are contradictions in reality; reality is what it is. The ones who attribute contradictions are we ourselves, with our language". I liked that. Everyone thought he had made an argument without meaning. But, in fact, isn't he right?

A. Loparić Of course! At last, someone with some sense! Contradiction is between sentences, and sentences are linguistic objects.

ELG *What else would you like to say and to add to this interview?*

A. Loparić I would like to thank you, and I feel very honored in being chosen. I don't deserve it. That's all.

IMLD *Did you enjoy our interview?*

A. Loparić I liked the interview. I would like to say the following. When I look back, I am happy to have participated in the Campinas school of logic. To be exact, I did paraconsistent logic during the time I was in Campinas, but here at USP I didn't. It is linked to my years in Campinas. This is because, and this is a very important thing, I only know how to work in groups. I don't like to work alone. I can work alone if I am talking to someone. For example, these days I am working here redoing some proofs of theorems without abbreviations in the intuitionist calculus, but I am working with Valéria [de Paiva], who asked me to do this. So I am sending them by e-mail and I am interacting. I need to interact with someone to work. If not, I will do something else, I read the funny papers, play sudoku...

ELG *As a great teacher of logic, what would you say to future generations of students?*

A. Loparić There is one thing that... the most important thing to me about logic is the same thing I would say for mathematics; it is the rigor that we learn to have. It is that what is true or false does not depend on our will, you know, we have to prove it. That's why the big sin, I think, in these areas, is that you don't respect exactly that. You pretend to prove it without proving it, for example...

IMLD *Like Moro did when he condemned Lula, for example.*[11]

[11]Luiz Inácio Lula da Silva (1945) was the 35th President of Brazil, serving two terms (2003–2010). Since then, he has been persecuted by the conservative wing of Brazilian justice system and other institutions, with strong support from the media and a reactionary strata of Brazilian society, in a campaign devoted to extinguishing his reputation and his political party. Lula was arrested and could not participate in, or speak about, the presidential elections that took place during the second half of 2018, and he remained in prison for 580 days. In 2021 Lula recovered his innocence, nationally and internationally. Andrea did not have in life the joy of witnessing Lula's election as the President of our country, in 2022, for a third term (2023–2026).

A. Loparić Yes.

ELG *I teach logic for the philosophy course, and I see that they have a lot of interest in certain subjects that they think have political, social, "immediate" application. And I tell them this, "You are scorning one of the most important disciplines of all, which is logic, because teaching logic, from this point of view, is highly subversive..."*

A. Loparić It is highly disciplinary. And I will say this, I would like to add something. When I was 40 years old, I decided to learn to program, to learn a programming language and to program. And I learned everything about Pascal. I learned it, I programmed, I made programs. I even made a drawing program that the students called *MamaCAD*. [laughs] And computing deepened my conviction on this point, because computing taught me to be humble. Because in computing that's how it is... in logic, there is a thing, I don't like to use it, but there is the possibility of saying, "I leave it to the reader". [laughs] The person leaves it to the reader because the guy doesn't know how to do it and thinks it must be true. I found myself in a situation like this with the semantics of valuations for $S4$. I never finished the article on the semantics of $S4$, because for one of the lemmas, which I am convinced is valid, I never managed to finish the proof—and I did not use the famous expedient of leaving it to the reader. But the semantics of $S4$ is something I want to finish before I die. I have everything done, apart from the passage that I was unable to prove. I never found a counterexample, I tested it in every way, I used the decision method, but there is that passage that I know has not been proved... César Mortari later did a proof of the finite version of the semantics, the *tableaux* based on it. He was able to directly prove the completeness of the construction rules of the tableaux. He sent me this proof, it was on paper at that time, and I lost the paper and we no longer have this proof. For a long time, I periodically returned to the question. One day, I decided to quit until I managed to forget the path I was taking in the failed attempt; I decided to make space for something new to arise. Returning to the point about computing, there is no way to "leave it to the reader". There, if everything is not set up as it should be, the program just doesn't run... So computing taught me, computing confirmed for me, the need to know how to be humble, to say, "I don't know", "I couldn't do it". Ruses, sophistry, and deception do not work, and that is how it should be...

ELG *It has to be effective.*

A. Loparić It has to be effective, otherwise the program will not run. I often I ran straight into this, and the devil of the object of desire was stronger than me. It is a truth that is above me, I'm not the one who invented it, you

know, I'm not the owner, the queen, at most I am just a courtesan. I started to learn this in my high school math course.

I started there, then went deeper with all my passage through logic, and the supreme step was in computing. Even if it has no application to this or that, you can enjoy this work as an exercise and experience the requirement of respect for the truth. In my experience and in my understanding, the exercise of logical research and the experience of programming can bring, for those who are interested and engaged, a greater understanding of what it means to develop intellectually honest work. That's what I would have to say.

ELG Thank you very much for your statement. What you have said is very beautiful.

3 Acknowledgments

We would like to thank Andrea Loparić for sharing with us her memories and reminds.

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