ICLP 2009 Dinner Speech

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I am thinking about the next few minutes with trepidation. When David and Pat asked me to be the banquet speaker, I agreed as, in general, I have a hard time ever saying no. Only later did I realize how difficult is the task I committed myself to. David suggested it should be easy as I had seen my share of banquet speeches and I knew what they are about. But this was precisely what made it so hard!

After all, how can one match the Logic Programming Trio of Alan Robinson, Jacques Cohen and Koichi Furukawa that graced ICLP dinners in the early years of the conference? Can one reasonably hope to equal the performance by Veronica Dahl and Agostino Dovier in Udine at ICLP 2008? And on top of that, we also had several outstanding "regular" speeches. In 2006, Bart Demoen gave a great dinner talk, exceptional as it was impromptu. And in 2007, Peter Stuckey made his speech that much more entertaining by delivering it while juggling an ever increasing number of balls. There is a little story behind these two talks. Sandro Etalle and I were the PC chairs in 2006 and we decided to ask Peter to be the dinner speaker. Well, we invited Peter alright, and he agreed to do it, too, but then he did not come. When Sandro and I were looking at our email exchanges with Peter ready to fire an angry inquiry, we noticed that the invitation mentioned ICLP 2007 not 2006! Just a little typo. But it had two consequences. Bart got a chance to display his awesome improvisational skills, and Peter ended up booked for ICLP 2007.

I have none of those skills and so I have to try something different. Being Polish and speaking to the audience of logic programmers, I feel naturally bound to weave into my speech themes going back to the Polish School of Logic, also known as the Warsaw School of Logic. Can that material be made into a banquet speech? Well, the next few minutes will show.[1,2]

The school came into being in 1920s and 30s of the last century as a direct result of the idea that starting so much behind the world in mathematics, the only chance Poland had to catch up was through the focus on selected emerging areas, and through the development of specialized publication venues. This was quite a novel approach to doing science and I will come back to that thought later. Anyway, foundations of mathematics were among the selected areas of interest and

[1]Disclaimer: This is just a dinner speech and not an effort to present a comprehensive and accurate perspective on the Polish School of Logic, its people and its contributions.

[2]I list sources I based the material on after the text of the speech.

so a major research effort in mathematical logic in Poland was launched. The three great pillars of the Polish School of Logic were Jan Łukasiewicz, Stanisław Leśniewski and Alfred Tarski. But there were many others, like Mojżesz Presburger and Adolf Lindenbaum who perished during the WWII, and Andrzej Mostowski, who survived and extended the tradition into the years that followed.

Is the school still relevant to us at all? Łukasiewicz's connections to logic programming are quite clear. He invented or, as others would have it, discovered multi-valued logics while struggling with the idea of determinism. We all know there would not be the well-founded semantics without that third truth value. Three-valued logic continues to inspire researchers in our field as witnessed also by this year's program. One of the papers is directly concerned with the logic proposed by Łukasiewicz. Łukasiewicz also developed several axiomatizations of propositional logic and, of course, invented the *Polish* notation. But multi-valued logics has had probably the most significant impact on our discipline.

However, there is yet another important connection. Łukasiewicz was also extremely effective as an organizer of the scientific life in Poland. He was Minister of Education for a year in 1919, soon after Poland regained independence, and served twice as Rector of the Warsaw University. Łukasiewicz was particularly interested in ensuring that Polish scientific publishers were open minded towards mathematical logic and would consider papers from the area publication. It was not necessarily true in countries leading in mathematical research. And so it happened that two fundamental to us papers by Herbrand were published in the Proceedings of the Warsaw Scientific Society.

Leśniewski is a different story, quite tragic in fact. He flatly rejected the axiomatic set theory, which was already very well established in Poland as well as everywhere else in the world. That put Leśniewski at odds immediately with every major mathematical figure in Poland, alienated him from the community and resulted in conflicts that clouded his research career. But Leśniewski was not just an obstructionist naysayer. He developed an alternative framework for foundations of mathematics to use instead of the axiomatic set theory. It consisted of ontology, mereology and protothetic and, most importantly, it worked! However, with the axiomatic set theory already entrenched, the approach never gained any traction. Leśniewski's proposal was forgotten and remained forgotten through many years that followed. Lately, though, Leśniewski's theory of mereology — theory of the part-whole relationship – turned out to have some bearing on the current work on the formal foundations for knowledge representation and the semantic web. So, Leśniewski's work may yet emerge from oblivion.

However, Leśniewski's major contribution was that Tarski was his doctoral student. Leśniewski used to boast that 100% of his doctoral students were geniuses. With Tarski being Leśniewski's the only doctoral student, the claim is certainly true. Tarski is of course responsible for the theory of truth, the theory of consequence operators, and the semantics of first-order logic, all necessary for the development of logic programming. Andrzej Mostowski was Tarski's doctoral student and that is important, too. First, Bob Kowalski spent a year in Warsaw on the exchange program between Warsaw and Stanford Universities, and attended Mostowski's lectures and seminars. Second, Krzysztof Apt was Mostowski's student. The connections of the Polish School of Logic to logic programming are indeed real!

I just mentioned Bob Kowalski and, of course, it is hard not to. As we all know, Bob en-

capsulated his vision for computing through logic in the phrase that constitutes the most concise description of the essence of declarative programming: Algorithm = Logic + Control.

Such natural language identities, even if so to the point as this one, always worry me. They make me want to apply laws of algebra to them, and the results are invariably confusing. They can also get one into trouble as one rabbi learned some time during the two wars in a small place in eastern Poland. Concerned about the behavior of his community in the synagogue, he affixed to the doors a stern warning: To enter without the head cover is like having extramarital sex. The next day somebody scribbled below: Not true. I tried both. Huge difference! Well, Bob's vision for logic in computing also stirred objections and even prompted quite vehement attacks. Yet, it stood the test of time. What does it tell us about Bob's opponents? Perhaps only that they were not thorough. Unlike that anonymous critic of the rabbi's admonition who, remember, tried both before making his statement, Bob's critics might have neglected to try logic and control.

Well, back to Polish School of Logic. Mostowski's research seminar that Bob attended was quite famous for its approach to speakers. One of the main principles it was founded upon stated that the main goal for the audience was to prove that the speaker does not know what he or she is talking about; even if the speaker knows, the results are trivial; and even if the results are not trivial, there are much better proofs already known to the audience. I think that if we took that principle to heart, it would make ICLP sessions much more entertaining and, more importantly, we would all benefit even more from participation.

That principle was tough but not really abusive to the speakers. Unfortunately, the line between toughness and abuse in science is quite thin. One of the luminaries of Polish mathematics wrote in one of his reviews: "... The paper contains results that are interesting and new. Unfortunately, the results that are interesting are not new, and those that are new are not interesting."

True or false, this is a nice story playing on the meaning of boolean connectives in natural language. There are many other similar ones that exploit logical concepts. The two I will tell you are by Adlai Stevenson, the Democratic party presidential nominee in 1952 and 1956. The first one concerns quantifiers. After one of the campaign rallies he met with his supporters. When one obviously enthusiastic lady shouted "Mr. Stevenson, you have the vote of every thinking person!" Stevenson coolly replied: "Madam, we need a majority." The second one simply goes to the heart of logic and tackles the core concept of truth. In one of his political speeches Stevenson said: "I have been thinking that I would make a proposition to my Republican friends ... that if they stop telling lies about Democrats, we will stop telling the truth about them.

All this brings up an interesting possibility. Logic programming and nonmonotonic reasoning seem now to be forever engaged in the search of a killer application. It occurs to me that a truly grand challenge might be to formalize the domain of joke-making and to develop automated ways to generate them. One of the principles behind jokes seems to be the clash between the literal and the expected or commonsense interpretation of the narrative. Using default logic to explain what makes jokes funny, and using answer-set programming to generate them could keep us busy for a while and would surely draw attention from other areas. If nothing else, it might make the life of future dinner speakers that much easier.

But logic is not a laughing matter. For some it may amount to a cathartic, life-changing event. I will quote directly from Łukasiewicz and Leśniewski. I must warn you that the quotes contain

strong language.

First, Łukasiewicz said: "My critical appraisal of philosophy as it has existed so far is the reaction of a man who, having studied philosophy and read various philosophical books to the full, finally came into contact with the scientific method not only in theory but also in the direct practice of his own creative work. This is the reaction of a man who experienced this specific joy which is the result of a correct solution of a uniquely formulated scientific problem, a solution which at any moment can be checked by a strictly defined method.

Only a mathematician or a physicist who is not versed in philosophy and comes into casual contact with it usually lacks the courage to express aloud his opinion of philosophy. But he who has been a philosopher and has become a logician and has to come to know the most precise methods of reasoning we have at our disposal today has no such scruples.

That [Łukasiewicz meant — Kantian] philosophy calls itself critical. But how far it stays from true, scientific criticism! [...] When we apply to it the requirements of scientific criticism, Kantian philosophy collapses like a house of cards. At every step we find vague concepts, incomprehensible statements, unjustified assertions, contradictions and logical errors. Nothing is left except a few perhaps inspired ideas, a raw material that awaits scientific elaboration. That is why that philosophy has not performed its task, although its influence has been great. [...] Above all people have to learn to think clearly, logically and precisely. All modern philosophy has been incapacitated by the inability to think clearly, precisely and in a scientific manner."

I am grateful to Łukasiewicz for these lines. I have always felt inadequate in the presence of modern philosophy, finding myself unable to follow many of its arguments. Łukasiewicz reassured me, I am certain many of you must now feel the same, and helped regain self-confidence.

Leśniewski is no less interesting in that aspect. In 1927 he wrote: "Living intellectually beyond the sphere of the valuable achievements of the exponents of mathematical logic, and yielding to many destructive habits resulting from the one-sided 'philosophical' grammatical culture, I struggled [...] with a number of problems which where beyond my powers at that time, discovering already discovered-Americas on the way. I have mentioned those works [Leśniewski has in mind his papers published in 1911-1915] desiring to point out that I regret that they have appeared in print and I formally repudiate them herewith, though I have already done this within the university faculty, affirming the bankruptcy of the 'philosophical' grammatical — work of the initial period of my work."

These words got me thinking. Should we have paper repudiation sessions at ICLP? And, perhaps in parallel, scientific bankruptcy sessions, too? That might be really interesting. But then I realized, that it is not so clear cut at all. The only papers worth repudiating are probably only those that the world cares about and only the authors do not. Unfortunately, most papers are in the diametrically opposite category of those that nobody, cares about at all, except possibly the authors.

These were interesting times and interesting people. But what really makes them relevant is that these times and these people were responsible for discovering the way to do science as we know it and as we practice it today. The beginning of the 20th century is marked by the advent of focus on specialized areas, by the emergence of dedicated publication venues, that we now refined into

conference proceedings and special journal issues, and most importantly I think, by collaboration among scientists. Science was no longer made by sages working in relative isolation. Challenges and ideas were thrown into the open, whole groups toiled seeking solutions, discovering in the process this unique shared joy when the problem is about to fall, as well as the comforting presence of others when things were not working out.

When was the first joint paper published? I do not know but there are some obvious upper bounds. The famous Hardy-Littlewood collaboration dates back to 1913, and Russell and Whitehead their Principia in 1910. A more important question is why it the beginning of the 20th century that marked that dramatic shift. The problem, I feel, deserves a serious analysis.

Even if it were not Polish mathematicians and logicians who discovered this new way of doing science, they embraced it wholeheartedly. The atmosphere of collaboration permeated Polish Mathematics and Logic. It was a cornerstone of Poland's success in these disciplines in the years between the wars. Science was all that ultimately counted, all other differences vanishing in its presence. It was a sad and difficult time, a time of intolerance and injustice. And no one knew it better than Tarski, unable, being Jewish, to obtain a professor position in Poland. Yet, it was Tarski who famously said, that religion divides people but logic brings them together. Paraphrasing, we might say that programming unites us and makes us colleagues and friends.

Therefore, I close with that thought and propose to drink to logic programming, the most general unifier!!

Sources:

1. J. Woleński, Mathematical Logic in Warsaw: 1918-1939. In: A. Ehrenfeucht, V.W. Marek, and M. Srebrny (Eds.), Andrzej Mostowski and Foundational Studies, IOS Press, 2008.

2. J. Łukasiewicz, Selected Works (edited by L. Borkowski), North-Holland Publishing Company, 1970.