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20 May 2016

**Report on the Ph.D. dissertation by Jacek Wawer,
*Branching time and the semantics of future contingents***

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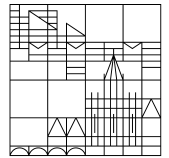
Dear Sir / Madam:

I am reporting on the Ph.D. dissertation presented by Jacek Wawer, *Branching time and the semantics of future contingents*, which has been prepared at the Institute of Philosophy of the Jagiellonian University, Kraków, in April 2016.

To summarize my report briefly: Wawer has written a fine dissertation from which I have learned a real lot. He presents a thorough, rigorous and up-to-date analysis of philosophically important issues in the semantics and metaphysics of branching time. Wawer's work clearly advances the field by offering both sustained, detailed critical discussions of extant work and an original, novel approach of his own, called "branching actualism". The dissertation is well written and well structured in a reader-friendly way. This is a work that offers valuable, novel contributions to a lively philosophical debate. The dissertation shows the author's deep understanding of the relevant issues, his impressive command of the literature, and his ability to do scholarly work at an international level. It is with full conviction, therefore, that I recommend that the dissertation be accepted, and Jacek Wawer be promoted to the subsequent stages of the Ph.D. defense.

Let me substantiate my verdict by commenting on the work in some more detail. I should note up front that the position that I have defended in some of my published works does not always agree with Wawer's position, as he rightly states. In all cases in which we disagree, Wawer's own position is well argued and coherently defended, and his work thereby provides important challenges for my own thinking about branching time and other branching frameworks. It certainly fulfills the author's proclaimed aim of helping us agree on what we disagree (p. 231).

Jacek Wawer's dissertation treats the venerable philosophical topic of future contingents from a semantic and from a metaphysical perspective. It contains thorough, up to date and original assessments of many theories connected to the framework of branching time. The author defends his own approach, branching actualism, before the background of a detailed discussion



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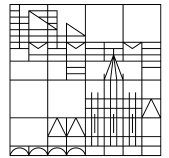
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of previous approaches and alternatives. In all chapters Wawer shows a clear grasp of the relevant literature, to which he had already contributed himself through publications in international journals.

The dissertation consists of six chapters and an appendix, which shows that the work is but a selection of the large body of original research that Wawer has conducted during his time as a Ph.D. student. The selection of the topics of the six chapters has been felicitous, making for a coherent whole. Therefore I limit my comments to Chapters 1–6. Let me say, however, that the six subsections of the appendix, which develop detailed formal arguments, add to the overall impression that Wawer does a great job at integrating philosophically probing discussions with precise logical work.

In Chapter 1, Wawer gives a brief introduction to his topic. He introduces an important, famous example of a future contingent, which goes back to Aristotle's *De Interpretatione*: There may be a sea battle tomorrow, and it may be that there will be no sea battle tomorrow; as of now, it has not been decided which. Now if somebody says that there will be a sea battle tomorrow, how should we react? Is that a proper thing to say? Is it true, or false, and if either, why? Wawer rightly points out that there are different attitudes towards the example, and to the more general questions behind it. The example is most naturally pictured in terms of a branching tree of possibilities. Looking at the tree, it seems right to say that the sentence is true or false, depending on which branch we consider – and none of them is privileged yet. Wawer makes it clear that his preferred view is not in line with that assessment, which he calls anti-futurism. In contrast, his view is that one continuation of the present situation is privileged after all: it is the actual continuation, the one that will happen, and it determines whether the sentence is actually true or false. While this option may sound completely commonsensical, there are well-known, much discussed objections against such an actualist theory. Wawer advertises the remainder of his work as a sustained argument in favor of his own preferred theory of branching actualism.

In Chapter 2, Wawer comments on what he calls “branching realism”, which is the view that the branching structure that we are prompted to draw in reaction to Aristotle's example is real. The author usefully distinguishes two strands of such realism – naïve branching realism (§2.1) and genuine branching realism (§2.2). The naïve picture is that the tree pictures the actual flow of time, or (in a space-time setting) that the topological structure of actual space-time contains bifurcations. Wawer shows that naïve branching realism is rightly discredited. He identifies Borghini and Torrenco 2013 as the most plausible example of somebody advocating the naïve theory in the literature; most other branching realists are more careful. The alternative for realists is to defend what Wawer calls “genuine branching realism”, which is the claim that the moments in a branching tree are real *as possibilities*. Wawer shows through a careful study of the literature that it is not easy (and may in fact be impossible) to get this view straight in a satisfactory way. I find his discussion analytically sharp and a real challenge for would-be branching realists. The author points out the importance – stressed by many branching realists – of



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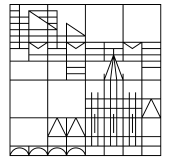
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distinguishing an internal perspective (the view of the “tree dwellers” as it were) from an external perspective of looking at the model “from outside”, all at once. In his view, making sense of realism means to show how the actual/merely possible distinction can get a foothold within a structure that is, as a whole, viewed as modally neutral. I agree that this is a tall order, and I find Wawer’s parallels to the temporal case (e.g., Fine’s non-standard realism) useful and telling. His criticism of expressions like “possible moments” (p. 20) strikes me as sound. I have some remaining doubts about Wawer’s rejection of genuine branching realism, though. For one thing, he sometimes shifts from contrasting actuality and mere possibility to contrasting actuality and possibility (e.g., p. 28). This may give rise to confusion, since what is actual is also possible, but not merely possible (mere possibility implying non-actuality). I believe that the genuine realist can use this observation to build a better defense of her position: “possible” could just mean “somewhere in the tree” and would not contrast with “actual “ after all. I also believe that Wawer misses a point when he says that we would have to conclude that the model, “Our World”, is actual. There is indeed a useful distinction between models of real possibilities to be made, if one allows for epistemic indistinguishability among them (which is surely our own epistemic situation); it may be possible to get the real structure of possibilities in our world right or wrong, and one might argue that science is exactly after that distinction. The correct model of our thisworldly possibilities, a realist might say, are actual in the sense of marking the right tree – this does not mean that each of those possibilities is a possibility that is actually realized (which would collapse the position to untenable naïve realism). Overall, however, I have to say that Wawer’s Chapter 2 is about the best critical discussion of branching realism that I have ever seen, and it provides a very good background for the later developments in the dissertation.

In Chapter 3, Wawer introduces the standard way of employing branching models in formal semantics, viz., Ockhamism (including metric tenses and the “At-t” operator). The author provides a brief but comprehensive, sound technical presentation of the framework, together with a discussion of a number of controversial issues such as why we should use operators rather than quantifiers – his criticism of King is sound, and I also agree that a more comprehensive discussion is not needed. It would be good to have at least a brief description of his own work (alluded to on p. 41). Also, in a published version I would like to see an account of indexicals in the temporalist case (lacking on p. 44), as well as a clarification of the claim that “now” works to eternalize a sentence, when in fact the main accounts of that indexical hold that it is vacuous at the beginning of a sentence. Overall, however, Chapter 3 provides a good, solid technical backdrop for the following discussions.

In Chapter 4, Wawer starts with the real work. The chapter is a detailed, thorough, scholarly discussion of all major branching realist semantics in the literature, including semantic and post-semantic approaches. Wawer gives a fair, critical assessment of each and every one of them. His discussions show that Wawer has a superb overview of the literature and that he has thought through every single approach carefully and in great detail. The overarching feature of branching realists is their acknowledgment of the fact that a context of a speech act (a moment

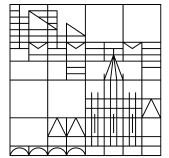


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in the branching tree) does not provide enough information to kick-start the semantic machinery of Ockhamism, which needs a history parameter as a second parameter of truth. Wawer's first achievement in the chapter is to sort extant accounts into a number of useful categories for discussion. His descriptions and criticism of extremism (§4.2), modalism (§4.3), many-valued semantics (§4.4) and supervaluations (§4.5) strike me as thorough, well connected to extant discussions of these approaches, and fair. Maybe the link between branching and many-valued semantics, which disappears from the scene after p. 68, could be strengthened, but it is true that the relation is not very strong (one might even argue that many-valued approaches should not really go under the heading of branching realism, but form a separate category). Wawer's discussion of assessment relativism (§4.6), a theory recently championed by MacFarlane, clearly profited from his personal discussions with MacFarlane; I would also suspect that the influence went both ways. I find the discussion thorough and probing, but I would not follow Wawer's argumentation at all points. For example, on p. 88 he advances the claim that context-sensitivity of accuracy ascriptions, rather than relativity of truth at a context, is the crucial feature to be accounted for, which opens a way to avoid assessment relativism. There is no discussion of utterances involving indexicals at this point, and I believe that Wawer's verdict might have to be changed once these types of utterances are fully acknowledged. Also his discussion of the normative dynamics of retraction obligations (p. 89ff.) strikes me as not fully in line with our linguistic practices. I believe that we can be faultless while doing something and still later on incur an obligation to retract or to apologize, so that the temporal retraction dynamics does not stand as isolated as Wawer claims. Also I think the way in which Besson and Hattiangadi enter the discussion, as an afterthought, is somewhat unfortunate. But it should be clear that with these remarks I am already entering a scholarly dispute with Wawer, who overall does a very good job at defending his claims. His discussions are always illuminating. This verdict also applies to the last two camps of realist semantics that Wawer discusses, viz., Belnap's history relativism and various strands of "local realism" (including my own). Without going into too much detail, I can say that I find that Wawer's work provides a wealth of important observations and probing arguments, and a perfect starting place for further scholarly exchanges. It should be obvious that I do not agree with all that Wawer claims. In §4.7, my main criticism is that the speech-act theoretic account of word-giving, which is behind Belnap et al.'s history relativism, does not find its proper place in the discussion – even though in fairness to Wawer one needs to say that Belnap's account is not so well integrated into an overall speech act theory as to make for a completely stable target for criticism. In §4.8, limiting my comments to my own account, it should be noted that Rumberg has greatly extended the few remarks about transition semantics from my own 2014 paper. Also, it is clear that the 2014 account is just a sketch; see, e.g., the remark on p. 361n18 for an indication of how to implement historical modalities. In the light of these considerations, Wawer's theorem about the Peircean nature of transition semantic validity (p. 125) is seen to apply only to the Peircean (box-free) fragment of transition semantics. It would be useful (but it is also very complicated) to find out how far Wawer's results generalize to the full language. Nonetheless, I applaud Wawer's decision to include these formal results on top of a thorough philosophical discussion. I also agree with his criticism of the cognitive



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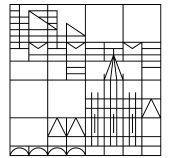
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motivation for “small objects” as parameters of truth; he is surely right that the full level of detail is hardly available to us not matter how far into the future we have to project alternatives. Maybe a reflection of the nature of semantic models as models might offer a more balanced view here. I could go on for a long time, but suffice it to say that I find Wawer’s Chapter 4 to be the best available discussion of branching realist semantics, including a wealth of new observations and critical arguments. It will undoubtedly be a starting point for many future discussions of the semantics of branching time. (Here I am, using the first future contingent in this report; felicitously I hope.)

In Chapter 5, Wawer comments on a different strand of the literature on the semantics of branching time, in which the branching tree is supplemented with a representation of “the real future” in some way or other. Wawer, who has himself worked on this type of theory and now abandons that attempt in favor of his branching actualism, employs the label given to these theories by Belnap and Green 1993, “Thin red line”. Wawer starts, usefully, with an overview of the metaphysical tenets of the Thin Red Line, which he likens to the “moving spotlight” approach in the philosophy of time. This analogy is illuminating, since – as Wawer says – a number of problems transfer. He also gives a fair assessment of who actually holds a Thin Red Line view, showing that this semantic theory is not just a straw man. Similarly to what is achieved in Chapter 4, Wawer in Chapter 5 provides a thorough, comprehensive and fair discussion and criticism of extant semantic accounts invoking a Thin Red Line. He presents viable and unviable semantic options, and he sorts extant criticisms of the theories into the categories of metaphysics, epistemology, actuality, semantics, and postsemantics (§5.3.1–5.3.5). His assessment, which I follow at all turns, shows that the Thin Red Line, even though initially appealing, is a bad idea. Wawer includes a fair amount of criticism directed to his own previous work, showing how the theory ultimately defended in his dissertation is the result of very serious intellectual labor.

Wawer’s dissertation thus culminates in Chapter 6, in which he defends his own approach to future contingents: branching actualism. Wawer is certainly correct that if one follows his assessment that all alternative approaches fail, branching actualism is the remaining plausible account for the semantics of future contingents. I have indicated above that I am not (yet?) ready to follow Wawer’s argumentation at all points, and I still hope that an alternative to the branching actualist picture can be defended. (To put my cards on the table, I would like to argue in favor of a transition-based local realism complemented by a speech-act theoretic account of assertion.) But I fully agree with Wawer that the issue is complex, and that one easily gets misled by seemingly innocent decisions about the semantics or postsemantics. So it is really worthwhile to see Wawer’s own account, which rejects the modal neutrality of the branching structure and affirms an absolute (perspective-independent) distinction between what is actual and what is (merely) possible. (I note that as in Chapter 2, Wawer often contrasts actuality and possibility, while the real contrast should be between actuality and *mere* possibility.)



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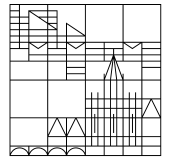
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Wawer states that his branching actualism “separates the sphere of branching possibilities from the concrete actual reality we are surrounded by” (p. 167). That actual reality then grounds the only perspective on the world that there is, the actual perspective. The semantic neutrality does not transfer to the level of metaphysics. Thus, while no possible circumstances are privileged semantically, only one possible circumstance represents how things really are (p. 168). The possibilities thus constrain how actuality *could* develop, but actuality in turn limits what is really possible. This corresponds to a “moving dot” account of actuality (p. 170). The tree model does not represent any specific physical process specifically – it represents all the possibilities, which are abstract. The world, on the other hand, is concrete, and it is actualized indeterministically (p. 172). Wawer holds that this picture is not one in which the actual development of the world is constrained by one special possibility. Rather, it is the other way round: that one possibility is singled out as the one that is realized, as time goes by, “at every indeterministic juncture” (p. 172). According to Wawer, this account gets around the initialization problem that troubled branching realists. We are not tree dwellers who would be part of many overlapping histories – we are concrete beings in the actual world. There is a “unique possibility that has been and will be actualized” (p. 175). Since every concrete utterance takes place as some concrete event in the actual world, the semantic machinery of Ockhamism can be initialized by actuality. An utterance context c does supply the two needed parameters, m_c/h_c . And from there, Ockhamism kicks in with the standard semantics. So the “futurist” postsemantic picture is, indeed, very simple. The author contrasts his account with the Thin Red Line approaches that typically posit a different semantics of the future operator, and with the different postsemantic theories that he had discussed. Branching actualism stands out as simple, coherent and superior to the accounts that were rejected before.

Wawer is, however, clearly aware that many people (myself included) will find his story somewhat fishy. He devotes a large part of his Chapter 6 to a defense and further exposition of his views. This part of the chapter shows that Wawer has thought about his position very deeply, and that he is keenly aware of possible objections and different views. In §6.3 he gives a detailed answer to objections, copying the structure of the discussion of §5.3 and adding a further consideration about possible predictions. In §6.4, he spells out what follows from his position with regard to branching possibilities, their reality, and their nature. He holds that genuine realism is not needed to give a proper grounding of historical possibility and for ontic indeterminism – according to Wawer, no “knock-down argument” has been provided (p. 212), and so he offers his theory as a viable account of a puzzling philosophical issue – future contingents –, to be judged by its pragmatic merits.

Wawer defends a branching account of possibility in §6.4.4, basically by recourse to the problem of emerging histories in a divergence (or “ $T \times W$ ”) setting. I fully agree with his assessment there. Chapter 6 ends with a discussion of localism vs. trans-localism about truth, in which Wawer argues that a notion of truth stripped of all necessitarian overtones meshes nicely with his futurist postsemantics.

Chapter 6 is the most original chapter of the dissertation – which says a lot, since the other chapters also contain much that is new and thought-provoking. I cannot in this review give a full



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assessment of the merits of all of Wawer's arguments and discussions individually. Rather I believe that time will tell which of his arguments will be accepted as real advances of our present stage of insight into future contingents, and which will be challenged. I would still like to see an alternative to Wawer's futurist postsemantics succeed. But he has raised the bar very considerably. Chapter 6 does an excellent job at spelling out and defending a coherent and suggestive postsemantic treatment of future contingents, which no future discussion of future contingents can choose to ignore. This is a remarkable achievement of its own, and even more so in the context of the many excellent contributions of the other chapters.

To sum up my assessment again: Wawer's dissertation is a scholarly work of high quality living up to international standards. The dissertation is well structured and well written. (I note that the work at this stage contains quite a number of typos and small glitches in the English, which need to be corrected before it can be published. The text should, therefore, be thoroughly proof-read and language-checked. This point does not, however, interfere with my overall positive assessment.) Judging by the content, it is clear to me that Wawer's dissertation should be published, since it provides an up-to-date overview of branching time, a thorough discussion of extant semantic and metaphysical theories connected to branching time, and an original semantic and postsemantic theory devised by the author himself. It will therefore be an important resource for any researcher working in the area. I believe that the dissertation has the coherence and substance needed for a publication as a book. By this I do not mean, however, to discourage publication of parts of the work as individual journal articles. Many of Wawer's contributions are precise, clarifying and much needed interventions on a sometimes confusing (or even confused) body of literature, and these points could also be made know through individual articles.

With full conviction I attest to the fact that the Ph.D. dissertation presented by Jacek Wawer is accepted as presented and fulfills all the requirements of such a scholarly work. It is, therefore, recommended that Jacek Wawer be promoted to the subsequent stages of his Ph.D. defense.

Yours sincerely,

(Prof. Dr. Thomas Müller)