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# Mileva — a Dialogue About General Relativity as Regional

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## Abstract

In this dialogue, Mileva and Albert start to talk about physics and its subject matter, the physical. They end up in a situation that permits causal dependence between separate ontological domains. In this possible world, they continue talking. First, they Socratically agree that the physical is physical and only physical. Then, they call the physical an ontologically homogeneous domain. They then generalise the principle that the physical is causally unaffected by anything non-physical, into the principle that ontologically homogeneous domains do not cause ontologically homogeneous domains. From a modern point of view talking about black hole singularities, they continue discussing the Chandrasekhar limit and the collapse of the physical laws as we know them. Mileva carries a burden and Albert stands up and carries it with her. The burden is an implication of the generalised principle. Relying on parsimony, only ontologically homogeneous domains are forbidden to cause ontologically homogeneous domains. This leaves the door open for ontologically heterogeneous domains to cause ontologically homogeneous domains. Also relying on parsimony, only ontologically homogeneous domains are forbidden to be caused by ontologically homogeneous domains and this allows ontologically heterogeneous domains to be caused by ontologically homogeneous domains. Ontologically heterogeneous domains, thus, are allowed to causally link ontologically homogeneous domains. Albert realises that the mathematical could qualify as an ontologically homogeneous domain and that the theoretical difficulties that are foreseen beyond the Chandrasekhar limit could be addressed by expanding physics into a context that contains also an ontologically heterogeneous domain. The theoretical difficulties beyond the Chandrasekhar limit would be due to an emergent mathematical-physical domain. Mileva concludes that Albert's theory is not faulty but regional. A global theory would have to include the explanation of the mathematical-physical.

*Mileva:* When we try to understand physics, do we know beforehand that there are physical things?

*Albert:* Yes, of course. Why are you asking?

*Mileva:* Then there are physical things, and they compose “the physical” would you say?

*Albert:* Yes.

*Mileva:* Sorry. I just want to be clear; everything that is physical is physical?

*Albert:* I'm with you.

*Mileva:* And if we look at potential things that are not physical, can they be physical?

*Albert:* That would contradict logic.

*Mileva:* Exactly! So, are all physical things only physical or could they also be of some non-physical kind?

*Albert:* I would say that physical things only are physical. Physical things do not consist of something other than that which is physical.

*Mileva:* Yes. Physical things are physical and only physical. Would you also say that physical things are of only one ontological kind?

*Albert:* What do you mean?

*Mileva:* I guess I wonder if you would say that the physical is an ontological kind. If you think so I would suggest that a domain of things of only one ontological kind is called an ontologically homogeneous domain. What do you say?

*Albert:* That's all fine by me. I would call the physical an ontologically homogeneous domain.

*Mileva:* Would you say that anything physical can be affected by anything that belongs to an ontologically homogeneous domain that is not physical?

*Albert:* That's a lot of words – but absolutely not.

*Mileva:* So, if I ask you if an ontologically homogeneous domain can affect another ontologically homogeneous domain, would you deny it?

*Albert:* Perhaps, but that would depend upon what we mean by "affect".

*Mileva:* Okay. I'll restate the question: can an ontologically homogeneous domain cause anything in another ontologically homogeneous domain?

*Albert:* I cannot see how that would come about.

*Mileva:* This is what I've been thinking of. Another way to put it would be if an ontologically homogeneous domain can cause an ontologically homogeneous domain. Do you think that?

*Albert:* No. Have you followed that thought through?

*Mileva:* I cannot say I have. I wanted to do that with you. What do you think?

*Albert:* It's so naked. An ontologically homogeneous domain cannot, or does not, cause an ontologically homogeneous domain. If we hold on to this principle, we open the door to the possibility of one or more ontologically heterogeneous domains. Methodologically, of course, we cannot rule out the possibility of such domains without dealing

with them. The principle of parsimony, also, would permit ontologically heterogeneous domains to both cause and to be caused by ontologically homogeneous domains as we already have a causal closure account. What's happening Mileva? Have you looked into anything like it?

*Mileva:* You don't want to know.

*Albert:* I do. Please tell me. What's happening?

*Mileva:* Do you know the Chandrasekhar limit?

*Albert:* Yes. What about it?

*Mileva:* Everything collapses ...?

*Albert:* Yes?

*Mileva:* The limit of physics ...?

*Albert:* I'm not sure about that.

*Mileva:* What if it's not an end but an opening?

*Albert:* Do I want to hear this?

*Mileva:* It's up to you.

*Albert:* Okay. Let's see. We have our principle of parsimony that permits ontologically heterogeneous domains to cause and to be caused by ontologically homogeneous domains. So, the physical is allowed to be caused. By an ontologically heterogeneous domain. Do we know anything about that?

*Mileva:* No.

*Albert:* But we know that it could be caused by an ontologically homogeneous domain?

*Mileva:* Yes.

*Albert:* That domain is the mathematical?

*Mileva:* I think so, yes.

*Albert:* My God!

*Mileva:* Do you know the good news?

*Albert:* Beyond the Chandrasekhar limit, an ontologically heterogeneous domain may be caused that does not cause an ontologically homogeneous domain. It just is. An ontologically heterogeneous domain that saves physics from breaking down. It only has to be expanded beyond itself.



*Mileva*: Back to mathematics. The thing beyond the Chandrasekhar limit is in a mathematical-physical domain. It is both mathematical and physical. That's why physics cannot explain it. Your theory isn't faulty. It's regional.