

I would love to be present for a conversation between Nora Bateson and Vaclav Smil. I thought I knew what to expect after viewing the documentary with Nora, but I was still struck and surprised by the extent of her systems thinking in class on Thursday. I continually wanted to chart out and sketch the systems that she was discussing, in order to keep track of all of the details she was bringing up. She seemed to weave intricate systems with no effort, which I suppose makes sense for someone who was born and raised in the world of systems thinking. As a newly converted systems thinker it was inspiring, but also intimidating and to be honest went over my head at times. I was in awe of her incredible ability to keep things abstract and zoomed out while still discussing minute details. Listening to her helped solidify some concepts we had discussed in class about systems, such as the fact that systems thinking *does* have a point of view. When trying to be a systems thinker, I find that I tend to zoom out as far as possible to try and include all elements. However, Nora reinforced the importance of having this perspective without losing sight of the facts and data. She helped me understand that systems thinking acknowledges an individual lens and potential blind spots that come along with that, as well as the possibility for many different lenses and ways of seeing things. This was explicitly obvious when she took the time to answer the question: “Who is Nora Bateson” completely unprompted.

Applying some of Bateson’s concepts to Smil’s work makes me think that Smil is on the path to systems thinking, and has laid the foundation by thoroughly explaining the various parts of a system. Throughout his text, I was continually surprised at his depth and amount of detail in his discussion of various systems. If him and Nora were to speak, I believe that they would have an incredibly academic discussion about the topic at hand, and enlighten each other with their impressive depths of knowledge. I think Nora would broaden Smil’s thinking and encourage him to think more about the interconnectedness. Smil acknowledges some connections and relationships in his text, but at times it came off as a way to transition from one subject to the next, instead of truly seeing the broader relationship and taking part in systems thinking. He begins to explore the relationships of these parts with arguments such as “the growth in car ownership was achieved as a result of mass production of affordable designs of family cars”. Even in these attempted connections, Smil still feels linear. Bateson might argue that this production could be one factor, but does not illustrate the whole picture. What about the cultural change that simultaneously occurred to make this possible?

I was especially intrigued by Smil’s discussion of personal automobiles and our use of them. I knew that they were a large contributor to greenhouse gas emissions and used massive amounts of energy, but I did not realize that they account for 15 trillion passenger-kilometers, or about  $\frac{1}{2}$  of the world’s transport activity. Because of their wide-scale municipal use and massive amounts of energy required to sustain these systems, they are an obvious system to target when considering how to transition to a more sustainable energy path. I was completely enlightened by Smil’s discussion of this system; I feel like the problem is so often watered-down to finding an alternative to gasoline, but it seems like there are so many more places to intervene in the system now that I understand the facts and am able to conceptualize the relationships from a systems thinking perspective. After Bateson’s discussion, I was inspired to examine this topic while keeping Bateson’s concept of changing perception in systems (multiple perspectives) in mind. I found this useful in increasing my understanding of today’s energy use, as well as providing potential places to intervene for transitioning to a more sustainable energy path based on Smil’s text.

Throughout my examination, I was also reminded of Bateson's struggle with figuring out how to approach larger institutions and implement change. She discussed our tendency to think in a "blueprint" fashion, and argued that our separation between cultural change and environmental change is not serving us. I was inspired by her argument that "institutions are the point at which contexts cross," and emphasis on breaking the view of institutions as an engine where you can simply fix the individual parts. This was especially interesting and ironic to apply to Smil's discussion of the *actual* engines of personal automobiles (internal combustion engines), and their extreme inefficiency. The "...modern engine will convert no more than 20% of fuel to reciprocating motion – the rest is waste heat," (Smil, 141). I was shocked that only 2-8% of the energy of purchased gasoline is converted to the kinetic energy necessary to move a vehicle. Looking at this with Bateson's concept of multiple perspectives in mind, I immediately thought about linking these relationships with opportunities to create a more sustainable future. Why are the efforts around making cars more sustainable so concentrated on finding an alternative form of fuel, instead of working with what we already have and attempting to increase the *efficiency* of the system? Doing this would not mean that we shouldn't look for alternative fuels, but it seems that there are multiple ways to intervene in the system. Smil states that various technical improvements have made vehicles more reliable and more affordable, but other than that the fundamentals of internal combustion engines have not changed for more than a century. He sets the foundation for systems thinking by mentioning other parts of the system/problem of vehicle inefficiency and energy use such as: under-inflated tires (which are the most common cause of easily avoidable energy loss) and bad driving in the form of idling and rapid acceleration. Building on Smil's analysis, Bateson and systems thinking would recognize the need for a cultural shift in addition to technical shifts of the engine itself if we were to attain a more sustainable system. I think that Bateson's concepts take Smil's text to the next level by drawing a complete picture of relationships. This web exposes multiple opportunities for intervention, instead of looking at the institutions that create personal automobiles as an engine where you can simply fix the parts.