

Reading Werner Heisenberg's 1958 book *Physics and Philosophy* was a turning point; the "narrow and rigid" way to conceive of "reality", Heisenberg explained, which our general culture imbibed from 19<sup>th</sup> century science—or the **narrow frame** as I'll be calling it based on his diagnosis—was *detrimental* to culture:

"[T]he nineteenth century developed an extremely rigid frame for natural science which formed not only science but also the general outlook of great masses of people. This frame was supported by the fundamental concepts of classical physics, space, time, matter and causality; the concept of reality applied to the things or events that we could perceive by our senses or that could be observed by means of the refined tools that technical science had provided. Matter was the primary reality. The progress of science was pictured as a crusade of conquest into the material world. Utility was the watchword of the time.

On the other hand, this frame was so narrow and rigid that it was difficult to find a place in it for many concepts of our language that had always belonged to its very substance, for instance, the concepts of mind, of the human soul or of life. Mind could be introduced into the general picture only as a kind of mirror of the material world."

The results of 20<sup>th</sup> century physics, Heisenberg pointed out, constituted the **narrow frame's rigorous disproof**:

"Coming back now to the contributions of modern physics, one may say that the most important change brought about by its results consists in the dissolution of this rigid frame of concepts of the nineteenth century. Of course many attempts had been made before to get away from this rigid frame which seemed obviously too narrow for an understanding of the essential parts of reality. But it had not been possible to see what could be wrong with the fundamental concepts like matter, space, time and causality that had been so extremely successful in the histo-

ry of science. Only experimental research itself, carried out with all the refined equipment that technical science could offer, and its mathematical interpretation, provided the basis for a critical analysis or, one may say, enforced the critical analysis of these concepts, and finally resulted in the dissolution of the rigid frame.”

Heisenberg wrote *Physics and Philosophy* anticipating that *the* most valuable gift of his field to humanity would be a *cultural* transformation; which would result from the dissolution of the ***narrow frame***.