



PHILOSOPHY OF DAPPLED THINGS

A CONVERSATION WITH NANCY CARTWRIGHT

By Gry Oftedal

GLORY be to God for dappled things –
 For skies of couple-colour as a brindled cow;
 For rose-moles all in stipple upon trout that swim;
 Fresh-firecoal chestnut-falls; finches' wings;
 Landscape plotted and pieced – fold, fallow, and
 plough;
 And all trades, their gear and tackle and trim.
 All things counter, original, spare, strange;
 Whatever is fickle, freckled (who knows how?)
 With swift, slow; sweet; sour; adazzle, dim;
 He fathers-forth whose beauty is past change:
 Praise him.
 Gerard M. Hopkins (1844-1889)

Since the beginning of the 1990s Nancy Cartwright has occupied the post once held by Karl Popper: Chair of Philosophy at the London School of Economics. She is one of the most distinguished and influential contemporary philosophers of science and famous for arguing the falsity of general physical laws in her book *How the Laws of Physics Lie*. She also argues, in *The Dappled World*, for a bottom-up metaphysical view where local scientific knowledge is the cornerstone, rather than lofty and abstract theories. She recently gave the CSMN annual lecture on the Mind in Nature called «The incompleteness of physics and the hodgepodge of nature». After the talk she kindly agreed to engage in a conversation with *Filosofisk supplement*.

Knowing that Cartwright started out as a student of mathematics and physics, I ask what made her become a philosopher instead of staying in one of these fields?

– I suppose I always had an interest in philosophy from a certain religious standpoint. I was brought up as a Calvinist, and we debated questions of free will, determinism and predestination when I was a child. These are clearly philosophical issues, and I was always interested in philosophy without realizing it. Later, I was an undergraduate at the University of Pittsburgh, which has for many years been thought to have the leading American philosophy departments. I went there just when Pittsburgh was taking off, so philosophy offerings were wonderful, and the mathematics offerings weren't so wonderful. So I started leaning more towards philosophy and physics.

There was another reason she didn't stay in mathematics. As Thomas Kuhn said, a lot of science is done by problem solving and as a student of mathematics she very often had to work with problem solving in groups in the male-dominated mathematics environment.

– There is always this problem of being the only woman in a group of men. I just found it awkward. When I started university, it was just before the student rebellions, which happened while I was there. The University still had this idea of *in loco parentis*, and as a woman I wasn't allowed out of the dormitory at night! I *couldn't* join the guys in the study group. But then, even in the day when I could, it was just awkward. They somehow made a group, and I didn't fit.

– *But there are not so many women within the philosophy of science either?*

– No, that's right. But then I was in a philosophy department at least, with other women working there.

Cartwright underlines that her mathematics and physics background was still immensely valuable for her philosophical work.

– It just *created* the career. I spent the first half of my career being a philosopher of physics.

– *And you use a lot of examples from physics and economics to make your philosophical arguments. How strongly do you think good philosophy of science generally is linked to empirical results in the sciences themselves?*

– Well, I think it has become a truism in the field that you really ought to know a lot of science if you're going to talk about how it works. That is not entirely true. There is an awful lot of good work in the sociology of science by people who don't grapple with the details of the sciences. I know that in the science studies group that I am in at UCSD, there is a bit of tension sometimes between the historians and philosophers on one side and the sociologists and the communication people on the other. That's because some of the sociologists don't really like science, or at least so the philosophers say. They don't learn the science, and they study the science from the outside. But still, I think a lot of very good work can be done that way.

– *I thought you opposed so-called armchair philosophy?*

– Well, I do think you can do good sociological work – which is empirical. I'm just not sure you can do good [armchair] philosophical work.

Cartwright clearly has developed her philosophical views in close connections with the sciences. However, she is also placed in a certain school of philosophy:

– *You are often described as belonging to the Stanford school of philosophers together with for instance John Dupré, Peter Galison, Ian Hacking and Patrick Suppes. You all argue for some kind of pluralism and against the unity of science thesis. Could you explain more about what characterize the Stanford school and what it means to be against the «unity of science» thesis?*

– There is this view of a simple, tidy, elegant universe



ILLUSTRATION: LENE HAUGE

in which, in the limit, there is nothing but physics. And physics itself consists of a handful of simple laws (perhaps mathematically complicated to express, but still simple laws), which dictate everything that happens in the physics realm, and from there, everything that happens in the physical world. It turns out, when you press people holding this view, that they think this is the way it really is in nature. Though, of course, we could never duplicate that in our own science, so we shouldn't even try to build our own science to look like the way the world *really* is with physics dictating all. This is a vision that is really difficult to dislodge. Everybody in the Stanford school thinks this is a very, very flawed vision. It is one for which we don't have sufficient evidence or sufficient argument, and many of us think that it is a rather unpleasant world and one in which we'd rather not live anyway.

– *You have been developing over the years an alternative metaphysical position, which is condensed in the title of your book *The Dappled World*. Could you tell in short what the dappled world*

is?

– I think there is no denying that there are pockets of orderliness. There are pockets of the world in which things are *very* systematic, and in which very precise results follow from the initial conditions and can be predicted to follow, if only we are lucky and have the right descriptions of the situation. Now, I just think that that's not the way most of the world is; most of the world around us looks to be unruly. Things occur «by hap», and not even under probabilistic law. If we are careful, we can engineer things to be more and more orderly, but that order is something one has to work for, rather than what comes naturally.

– *I suspect you are no fan of Ockham's razor?*

– No, I don't see why anyone ever wants to use Ockham's razor. I think there are as many things as there are. And there is no reason to just say «We can make a picture that has only three parts in it, so there are only three parts in the world». Why think that God had such a limited imagination?

– *In the dappled world, how do you see the relations between different patches, levels or domains? Are any levels dependent on each other, and if not, what are then the relations between different domains?*

– I don't think that higher and lower levels are independent. I think there are a lot of causal relations between what we call higher and what we call lower levels. There are for instance causal relations from entities conceptualized in classical physics to quantum effects. Concepts which make sense only in classical physics are necessary to put in as causes in quantum models in order to predict quantum effects. Often people think of classical physics as a different level, or an outmoded theory, or a theory whose concepts have to be reduced to those of quantum mechanics. I just find that there is no sufficient evidence for that. It is only if you have predictions just about things abstractly described in the model, that you can do only with quantum mechanics.

According to Cartwright, this links in with the thinking of Otto Neurath, who spearheaded the unity of science movement. She explains that Neurath didn't really have the idea that there was a unity of science. According to Neurath, there was no pyramid of sciences. There was only «unity at the point of action». He thought, Cartwright explains, like an encyclo-

pedist, that it was really important to make use of all the scientific knowledge there is, or all the scientific knowledge that is relevant whenever you have to solve a problem.

– You want to be able to unify the sciences at the point of action. Neurath says that the sciences relate differently depending on what problem you are solving; depending on what you examine, you bring different bodies of knowledge together. I have this metaphor on the cover of *The Dappled World* where each science is represented by a balloon. These are the balloons of knowledge about a certain subject, and you can press them up against each other and they change shape. You can also tie them and re-tie them in different bundles depending on what problem you have to solve. There is no balloon of knowledge which is more fundamental than the other.

– *So you talk of balloons as a metaphor for domains or levels, then?*

– Yes, and you can put the information that is represented by a balloon in an encyclopedia. But then you organize it alphabetically. You don't say: «Here is the fundamental information, and, in some way, it accounts for the rest of the information». I think that all successful treatments of what happens (causally) to small things, involve concepts that refer to big things. And our best explanations of what happens in the social world around us involve persons with their intentions causing physical motion somehow, for instance; your invitation caused me to get here. The idea that what you see is not what there *is*, disturbs me. I don't think one should take the idea for granted, that what you see is what there is either, but it is at least a starting point. And if that is not what there is, there ought to be good reasons or sufficient reason to the contrary.

– *Could you give an example of a situation where treatments of causes and effects in one domain need the involvement of concepts from other domains?*

– Imagine you want to build a laser. You want a very precise outcome so that you can use it to operate on someone's eyes. The best description we can give of the operation of the laser involves a zillion different kinds of concepts, not just the concepts from quantum physics. And then there is the idea that all these other concepts can all be cashed out, ultimately by God at least, in terms of quantum physics. This seems to me an unsupported piece of metaphysics. It might be the case, but why take that for granted? You *can*

operate on my eyes with a laser. That is why I believe in quantum mechanics. But quantum mechanics can't do it by itself. Our representations of how real quantum effects are produced have causes in them that are not properly represented by quantum concepts. And if you want to get these concepts into a quantum model, you put them there in an ad hoc way. You use a piece of mathematics that is consistent with quantum mechanics, but you don't have grounds for saying that that piece of mathematics represents something in the world. Rather, it is something you describe macroscopically in a different vocabulary, and then because you are forced to put it into a quantum equation, you just use the mathematics that catches the effect of it, but it doesn't properly represent it.

– *Won't a philosophy based on experimental evidence always be underdetermined in the same way as scientific theories? Experimental science indicating a dappled world is not sufficient to refuse a fundamentalist theory. Even though the world appears dappled to us, there could still be a unifying picture that we cannot directly observe?*

– Well, neither picture is supported well enough by the evidence for me to want to bet much on it. I think it's up for grabs, and I don't want us to be building important conclusions further down the road by assuming that this is pretty much fixed one way or another. Though, I would rather live in a dappled world, and I am glad that the appearances are dappled.

– *Yes, you often claim to have aesthetics on your side, that the dappled world is more beautiful than the alternatives. How is that?*

– I was walking a beautiful morning in Oslo over Barlindåsen in Maridalen. It was sunny, and we walked through the woods. We looked at mushrooms, and the light shone through the trees. There were puddles, there was a waterfall, there were beech trees with the wind blowing through them, and it was an *exceedingly* dappled world. I think that anybody who goes into these woods around Oslo could hardly fail to be impressed by the beauty of the dappled world. Now, I don't know, because I don't ski at all, but if you go to these areas in Norway that are covered in snow all the time, maybe that is not a dappled world. Maybe it is just uniform with no contours, just grey sky and white snow, and maybe that is beautiful too. I have never experienced it, but I don't believe it is totally undappled. Still, there probably are things that are not dappled which are beautiful too. But one co-

uld hardly fail to be moved by the dappled world.

Moving to a less poetic topic, Nancy Cartwright is often described as a realist and an empiricist at the same time. These are positions that often are seen as incompatible, so I wonder how they go together in Cartwright's work.

– Of course it depends on what kind of empiricist and what kind of a realist one is. But I don't think you can describe the world with some concepts which are 'given'. You have to observe the world through human concepts, and human concepts have got a lot of assumptions and pre-knowledge built in. Some of the best ways of observing the world or describing what you observe will be what we call theoretical. Whether or not a set of concepts for describing the world is right or not, is a really complicated matter. I don't see an incompatibility between realism and thinking that the best way to back up claims about the world is by looking at the world, by assembling facts, and by taking very small inductive steps, rather than big inductive leaps. This is what I think of as empiricism. I don't think that can be incompatible with being a realist about certain kinds of scientific concepts that are normally thought of as theoretical; all concepts are part of the human invention. No matter what kind of empiricist you want to be, you are going to have to use some language and some set of concepts to come to the world with, and my view is just that, in refining them, you should keep looking at the world itself, and make small steps rather than big steps.

– *Is that what you call local realism?*

– Yes, that's right. Whether or not this is a reasonable view, my view has been that, the further up the ladder of abstraction and generalization you go, the more it looks as if your laws lie. So when considering the design of the laser, you have a volume of very complicated description of how the laser is working, which in a sense constitutes a law. Now, this law seems to me to be true, and we have got lots and lots of good reasons for thinking it is true, although that description will use a lot of theoretical language. But then, as we try to get up to the fundamental laws of quantum mechanics, those are far more abstract, and they are supposed to cover something far more general than that particular description of that laser. I think we have less and less reason to think that the fundamental laws of quantum mechanics, way up the ladder of abstraction, are true, literally. You have to keep correcting them.

You have to *do* stuff to them. You actually have to add to them and change them to get to this description of a laser. Among other things, you'd have to add stuff that doesn't come in quantum mechanics, and you have to fit it into the quantum mechanics straitjacket in an ad hoc way in order to get these predictions out. The kind of argument I want to make is that, as an empiricist, I have to come to the world with *some* set of concepts. There is no good reason for having a dividing line saying that some concepts, just because they got labelled «theoretical», are not appropriate to describe the world with. I don't see how you can defend being an empiricist who thinks that what is observable has to be couched in some vocabulary that is privileged. I just don't see how to get that privileged vocabulary. So it is a bit like Otto Neurath; you've got what you've got. You've got the vocabulary you've got. It's a rather complex vocabulary, and you go out from there.

Turning back to the topic of causation, I ask Cartwright if there is room for mental causation in her view.

– I think that there are agents who *do* things and that I am one of them.

– *But would you say that mental causes have a different status than for instance causes in the natural sciences? Are they causes of a different kind?*

– Well, I think that somebody ought to figure out more about how it is that «my intending to» causes something. As we talked about, you invited me, and that caused me to come here. It is not something physical that caused me.

– *It could be a lot of physical things going on inside me that got me to invite you?*

– Well, I'll believe that when I see the properly empirically supported account, that «it got you» to invite me.

At the end of the interview, we turn to the development and the future of the philosophy of science.

– *What are the most interesting questions to ask in the philosophy of science at the moment?*

– I am a great advocate of the new Society for Philosophy of Science in Practice (SPSP). I think that philosophy of science has been too dominated by studies of theory. But I object when people describe me

by saying, well, Nancy is a part of this movement that got us to focus on how the sciences are *actually* practiced. But that suggests that people like Hempel and Nagel weren't concerned with science as it is *actually* practiced. Well, they were. It seems to me that they looked at it, studied it, talked to people, and then they gave broad descriptions. They intended, and didn't do such a bad job, to describe sciences as they are actually practiced. What they didn't do was to describe the actual practices. A lot of us got taken up with describing the actual practices, because we were concerned with philosophical problems *internal* to different sciences. That was the dominant trend for a long time. In the philosophy of science, as opposed to the history and sociology of science, a lot of the effort was focused on the practice of theoreticians, particularly in physics. The focus was on theory and how theory works. Not on how theory works to describe the world, but how theory works, somehow, in itself. All my life I have been interested in science as a tool for changing the world. Then it seems to me that we have had too much focus on the internal structure of theory. We act as if theory *is* something. I have no idea any longer what theory is. There was a long time when people debated whether theories are sets of axioms or whether they are sets of models. It sounds as if there *is* something such as theory, to *be* either a set of axioms or a set of models. There *are* sets of axioms and one can represent sets of models, but there isn't something exactly right or exactly wrong about that. There are a lot of practices in science, and there are claims, textbooks, and lectures, but where is this thing called theory? Is it somewhere in God's heaven? The idea of a theory that is represented in a right or a wrong way only makes sense, just like the laws of nature, if you think there is a book of nature, and God wrote it. If you think this is the case, there is going to be something in the book, and that is what theory is. And God might have been a semantic theorist about theories, so God might not have written in the book, he might have drawn models in the book, or maybe something else. But if you think that there is a book of nature that God wrote, then you may think that what scientists do is try to mimic God. But that is not what scientists do, and I don't think it was what God did. So where is this thing, the theory, that we philosophers of science have been talking about, and trying to get the right formulation of? I am very anti-theory. And I am very pro thinking much harder about how to use science, how science *is* used in practice, and how it can be better used in practice.

– *That was an appropriate finale. Thank you very much!*