

How Better to Register the Agency of Things

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*Tanner One – semiotic**

I have to make a confession: against my best friends' advice, I agreed to write and produce a MOOC, you know, one of those "massive open online courses" that university administrators believe to be the solution to contemporary education; and not just any MOOC but one on a topic I have labeled "scientific humanities". However, after watching Frederic Wiseman's new documentary called *Campus* about the day-to-day life in the offices and classrooms of the University of California at Berkeley, I realized that I had chosen a strange label since it appears, according to this film, that science is just as under attack as the humanities. And not under attack, mind you, from "social constructivists" who would deny the robustness of its conclusions but from administrators, financiers and politicians, in sum from the perspective of what is generally called "evaluation"— that is, a new mood, throughout the developed world, that no longer thinks about

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anything important but simply counts number of papers published and quantity of money stacked up before closing down departments.

That long-term basic science could be threatened in the way that has already been done for the learning of ancient Greek, the deciphering of Mesopotamian clay tablets, or the interpretation of Whitehead's metaphysics may be a radical way to solve the famous, much too famous, "two cultures" divide. Little would I have thought probable, forty years ago, when I started in science studies — or rather when the field of science studies had just begun to exist — that our task would not only be to breach the "two culture divide" but also to *defend* the two cultures together — that of Science as well as that of the Humanities — against a slow and, it seems, irresistible form of obscurantism. I am sure you have heard of the vast movement, starting in Italy, for replacing "fast food" by "slow food", but you might not be aware that Isabelle Stengers, one of the best examples of a two cultures scholar, had to issue a plea for "slow science": "*Une autre science est possible! Manifeste pour un ralentissement des sciences*".¹ Is this not an excellent definition of the *humanities*: an attempt at slowing down the sciences and bringing them back to Earth?

By opening a third front against scholarship broadly conceived, what could be called the accounting, auditing and evaluating craze (for obvious reasons I hesitate to call it a third culture!), opens new opportunities for all those scholars, whatever their fields, that such a set of practices tends to suffocate. My point is that it might be easier to resist such a deadly trend now that both science and the humanities are on the same side. At least, those are the opportunities that I will try to stress with you in two successive lectures.

It is under the notion of "agency" that I have regrouped some of the insights I gained from my work in science studies: hence the title: "How better to register the agency of things". Tonight, Agency-One will deal more with semiotics, that is, with the trajectories of meaning. Tomorrow night, Agency-Two will deal with a more difficult aspect, namely with ontology, or rather "ontonomy" (not autonomy), that is, with the crossing of what is and what should be, with the drawing of the rules of what is. In both lectures, I will try to speak as if it was possible to devise a *common language* for those who thought themselves to be in two different and mostly opposite camps until they have been submitted to the same attacks by a third party bent on closing down all centers of learning. It is thus an exercise in diplomacy: can we ally together so as to resist a new enemy?

¹ Isabelle Stengers. *Une autre science est possible! Manifeste pour un ralentissement des sciences*. Paris: La Découverte, 2013.

To make sure that you don't put too much false hope in what I am going to say, let me warn you at the beginning with this quote from Whitehead:

"The critical school confines itself to verbal analysis within the limits of the dictionary. The speculative school appeals to direct insight, and endeavours to indicate its meanings by further appeal to situations which promote such specific insights. It then enlarges the dictionary. The divergence between the schools is the quarrel between safety and adventure." (*Modes of Thought* p. 173.

Let us "increase the dictionary" by slowing down a bit and being unabashedly speculative.

If there is something common to science and the humanities, it is the habit of moving back and forth between "actants" to "actors". Actant is part of semiotics jargon and I agree that the word could put off those trained in the natural sciences. But as a practice, it is a fairly common movement: all entities manipulated by scientists start as a list of actions and slowly coalesce later into the name of an object that summarizes or stabilizes them for further retrieval. Even though this is how discovery is achieved every day, this is such a trivial transformation that it disappears from view as soon as it is achieved: for instance, episode one, a pad of cotton absorbs water first; then, episode two, it is named "hydrophilic". The difference between the two episodes (apart from the use of often garbled Greek etymology!) is that absorbing water is an *action* performed on some lab bench with some material contraption by some people who don't yet know what the "properties" of the material under scrutiny are, while "hydrophilic cotton" is a well known substance that has as *one of its attributes* the property of absorbing water. To use again the language of semiotics, the first is a *performance* — you cannot deduce what it is from what you slowly register it is actually *doing* —, while the second is a *competence* — from what it is you may draw the conclusion that it will be able, in the future, to *do* this and that.

The difference between the substance and the attributes can be couched as a philosophical idiom but it is important, at this stage, to take the difference as a *temporal* marker and a fully *practical* distinction: what was, at time t , a name of actions, a list of competences, an experiment made by people ignoring what they were dealing with, *becomes*, later, at time $t+1$, the name of a substance endowed with attributes. Although the concept of substance can be asked to play the role of what lies "under" the properties, it may also mean, in a more mundane manner, depending on how you play with the etymology of the word substance, what *subsists* after stabilization throughout the

paraphernalia of the “thought collective” (to use Ludwik Fleck’s terminology²). The concept of “discovery”, before being transformed into a philosophical conundrum, should first be kept as the index of a temporal trajectory from a list of properties at time 1 to a substance “covering” them at time t+1. “Recovery” of a competence through performances might be a better term for what is usually called “discovery”.

Hydrophilic cotton is too trivial an example to convince anyone of the ubiquity of this phenomenon of quick transformation from property to attributes. So, let me turn instead to a *topos* of science studies.³ As some of you may know, Harold Garfinkel and his colleagues have analyzed a much more beautiful and fundamental example when they had the occasion to listen to the tape of Cocke, Disney and Taylor’s discovery of optical pulsar.⁴

“We wish to report the discovery on January 16, 1969, 03h 30mn UT, of a strong optical pulses from the pulsating radio source NP 0532 in the Crab Nebular”.

Through an extremely rare stroke of luck, a tape was running at the very same time in the observatory so that the quick transformation of a *demonstrative* statement (a “it”, that is, a performance) to a *descriptive* statement (a “this”, that is, a competence) was recorded.⁵

Disney: (We’ve got a little bit of shape now).

(0.4)

McCallister: We::ll,

(1.0)

McCallister: (It’s) about like I saw in that sky: over there, t’ tell you the truth.

(0.5)

McCallister: Ther’s a nice di(hh)p on the (hh) si(hh)de of that sky.

(0.5)

² Ludwik Fleck. *Genesis and Development of a Scientific Fact*. Chicago: The University of Chicago Pres, 1935 [1981].

³ Andy Pickering, ed. *Science as Practice and Culture*. Chicago: Chicago University Press, 1992.

⁴ Harold Garfinkel, Michael Lynch, and Eric Livingston. "The Work of a Discovering Science Construed with Materials from the Optically Discovered Pulsar (reprinted in *Ethnomethodology*, Vol. 3. Sage Benchmarks in Social Research Methods, London, 2011, pp.214-243)." *Philosophy of Social Sciences*.11 (1981): 131-58.

⁵ Those are the terms proposed by Whitehead in the *Concept of Nature* with the example of the Lion House p. 7 et seq.

McCallister: I'm gonna turn this thing down.
 (2.5) ((machine sound – probably gain switch))
 Disney: We've got a bleeding pulse here.
 (2.0)
 Cocke: He::y!
 (4.5)
 Cocke: Wo::w!
 (1.2)
 Cocke: You don't suppose that's really it, do you?
 (2.0)
 Cocke: Ca::n't be:.
 Disney: It's right bang in the middle of the period. (Look), I mean right
 bang in the middle of the (sca::le).
 (0.8)
 Disney: It really looks something (from here) at the moment.
 (to me)
 (0.8)
 Cocke: Hmm:!
 (3.0)
 Disney: (An') it's growing too.
 (Hey)
 (1.0)
 Disney: It's growing up the side a bit too.

The great interest of this rare example is that Garfinkel, Lynch and Livingston have studied in painstaking detail (and God knows how painstaking ethnomethodology can be!) the metamorphosis from the runs on the screen in the observatory to what they called the “independent Galilean pulsar”. “Galilean” is the key term that indexes the metamorphosis from “it” to “this”, from the name of surprising actions to what is the substance behind or in addition to those attributes. A few minutes separate the two stages. What was dependent (the “optically discovered pulsar”) has become fully “independent” in the highly specific regime of establishing scientific referential paths, that I call reference [REF] for short:

“(1) The pulsar is depicted as the cause of everything that is seen and said about it.

(2) It is depicted as existing prior to and independently of any method for detecting it and every way of talking about it.

(3) The pulsar's technically detailed phenomena are made anonymous to Cocke and Disney's presence to them as witnessing persons and authors." P. 218).

The admirable achievement of their paper (famous for the astronomers as well as for the sociologists of science) is that the authors don't lose sight at any point of the temporal trajectory to capture such a metamorphosis: as soon as the second run is accounted as similar to the first surprising run, then, the active, passionate, fully embodied discoverers are already sure of not being confronted with an artefact and they happily jump to the conclusion that they have been *traversed* by a substance which possesses as one of its attributes the ability to leave a trace on their screen. What *subsists* through their work is now *out there*. Their naïve and moving exclamations at the very moment when they realize that there is such a persistence in the phenomenon, proves how aware they are of being at the intersection of two trajectories moving in the same direction: that of their patient work in the observatory and that of the pulsating optical signal now durably captured throughout the various institutions of astronomy.

2. Observation #18

Disney: This is a historic mo:ment.

...

Cocke: I hope it's a historic moment.

...

Cocke: We'll kno:w when we take another reading, and uh, if that -

(0.4)

Cocke: spike (there) is again right in the middle, see that's right in the m:iddle -

...

Cocke: That spike is right in the middle and that scares me.

We understand their excitement; they can be proud of what they have done: from now on there exist optical pulsars and there exist discoverers thereof. A new quality of the world has been recovered and registered, provided that is, that the *wave front*, of which the discoverers as well as "their" optical pulsar have become parts, continues to expand in time and space. For both discoverers and discovery, time is of the essence.

Before we explore later what I will call the "metamorphic" quality of such an event, I wish to stress that the shift from performance to

competence could offer a common place, a shared vocabulary, for science and for the humanities. Actually, this is what could be used, stylistically, in order to distinguish a paper in the natural sciences from a text in literature or critical theory. When most of the actors mobilized in a narrative are *not* known in advance, you have to render them familiar to the readers through their most minute behavior. It is only once you have assembled enough of those behaviors, that it becomes possible to summarize their actions by the shorthand of their name. An agency is added to the actions. Scientific papers solve this question of the lack of familiarity by going down to the most elementary features of perception — in the case of the pulsar, for instance, by showing in the text the very graph of the pulse left by what has begun to coalesce as the action of an optical pulsar.

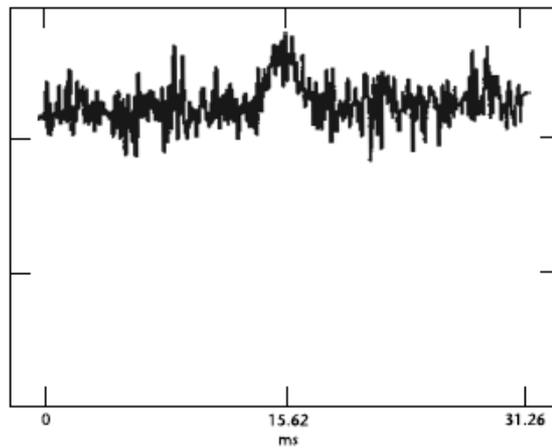


Figure 2: The first pulse observed on the CAT screen, January 16, 1969, 03^h 30^m UT, with 22 arc a diaphragm and summing 5,000 periods. The amplitude scale is arbitrary. The last 2 ms of the pulse period are not abored by the CAT

Even though you need a lot of schooling to interpret the legend of this slide, you need only the most elementary cognitive skills to detect the spike. A pigeon could do it! There is thus a direct connection, in natural science, between the lack of familiarity of the actant to be recovered and the simplicity of the perceptive judgments to be made by the reader. Or, rather, I should say, what we call “natural science” is most often what you realize you have been faced with whenever you read papers built on such a big difference between the visible and the unknown. This is where the relative *opacity* of the scientific literature comes from: you have to constantly fall back on elementary perceptions to achieve familiarity with entities that had no common presence in the world until then. The invisible and the far away is slowly built up from successive layers of amazingly simple perceptive judgments that have to be assembled one after the other with as little a gap as possible

between every layer. And of course, as we are all painfully aware, the gap is never so small that we don't run the risk of assembling an artifact instead of uncovering a fact. The sure thing is that as long as the assemblage has not been completed and the layers smoothly stitched together, you never get the inversion from name of actions to agency. The set of attributes remains like a puzzle ready to fall off the table or a flock of ravens ready to spread out.

This built-in opacity of scientific literature is compounded by the array of abbreviated phenomena that had to be previously recovered for the new perceptions to be elicited. Those "black boxes", as we call them, are signaled by technical terms and most often, in those days of even more frenetic "publish and perish", by acronyms of various sorts.

"The pulses were observed on January 16, 17, 18 and 20 (UT) with the Steward Observatory 36 inch f/5 reflecting telescope and a IP21 photomultiplier. They were observed in real time on the cathode ray tube of a 400 channel computer of average transients (CAT). The CAT adds successive cycles of the pulsation waveform in phase."

There is nothing really obscure or even complex in such a sentence, except for those, such as myself, who are unfamiliar with what a "reflecting telescope" or an IP21 "photomultiplier" or a CAT consists of. The impression of complexity comes from ignorance. (Of course, I could learn what those elements mean but then I would have to be conducted, for each of those terms, from the object-name back to each of its names of actions, from what it is from what it does. This is what learning means: to reverse the movement that has turned them into entities). In that sense, a black box is never really black, it is just made of a semi-reflecting surface that is opaque for the newcomers and transparent to the specialists. More exactly, the ease with which you read through the array of already familiar black boxes — or jump over them when you are in a hurry — defines you as a specialist to whom this paper on pulsars addressed.

All of this is fairly well known, but what is not so often stressed is that the situation is exactly *similar* although *reversed* for those who write in the humanities or in the social sciences. The specific opacity of their accounts comes from the hard work they have to do so as to *counteract* the familiarity which their readers believe gives them access to the characters acting in the narrative. If I write a paper on capitalism for instance, readers will not slow down and begin to be puzzled as much as they might have done when hearing about "a strong optical pulses from the pulsating radio source NP 0532 in the Crab Nebula". They will accelerate and begin to endow the entity "capitalism" with a vast

number of attributes as if they could “deduce” them from its prior existence. To slow down the readers, we will have to multiply scare quotes and write long, yes, often convoluted paragraphs, until we reach just the same state of puzzlement as natural scientists struck by the surprising spike made by a pen on the screen of their instrument. How far do we have to descend, layer after layer, toward the elementary features of actions before a reasonable and realistic definition of capitalism can be rebuilt from the ground up? And maybe the whole concept is an artifact that needs to be, as they say, “deconstructed” before being fully displaced and recomposed. And think of what would be needed to tackle bundles of makeshift concepts such as “gender” or “France”.

When natural scientists, forgetting the opacity of their own texts, mock the opacity of so many of our writings, it is because they don't realize how much easier it is for them — oh so very much easier! — with their untested claimants to existence, to obtain the distance and the lack of familiarity that we in our fields have to generate by sheer obstinacy and painstaking inquiries, laboring with devices just as artificial as theirs in our poorly equipped laboratories (I mean our studios and libraries).

I remember Roger Guillemin, my mentor at the time of writing *Laboratory Life*, complaining that “science is not a self-cleaning oven” and that his field, neuroendocrinology, was encumbered by many claims which were “not even wrong” (another of his favorite expressions) and that he had no time nor patience to “deconstruct” (this last word was not part of his vocabulary, he was a fully pre-postmodern!). But how can we write clearly and directly when we find so many concepts, so many entities, so many definitions, in need of reconstruction? Natural scientists are opaque because they recover new phenomena; we are opaque because we have to recover the novelty of so many old phenomena. What is common is that we all populate the world with entities to which is also attached — or in our case reattached — the long series of actions from which they come or to which they lead. Such is, it seems to me, the common space occupied by science and by learning. Let's call this double movement “scholarship” to cover both terms: no object-name without its name of action, no competence without its performances, no *pragmaton* without what it *does* (to restate William James's definition of pragmatism in a slightly different form).

It is the presence of such a common ground between different fields of scholarship that allows an archeologist specialized in the study of Clovis stone tools to understand what captivates an engineer of nanomaterial or why an anthropologist of the Anga of New Guinea will spend ten years reconstructing their rituals of initiation with the same meticulous passion as the astronomers we just encountered. This is

what makes them part of the same *university*. Not because their findings are similar, not because they are incontrovertible, not because they are universal, but because they share the same fundamental feature: when there is an agent, the list of behaviors that have composed this agency is fully retrievable.

What is admirable is that the *more formalized* a given field, the more obvious it will be that competences and performances will stick together without a gap. If there is one definition of mathematical object that is shareable whatever philosophical position you might lean toward, it is that *what they are* is entirely describable by *what they do*. Mathematical objects are born pragmatic, so to speak, in the sense that they behave just as they are defined (well almost), so that what is meant by substance and what is meant by attributes are exactly reversible. The many little gaps that have to be stitched together and slowly smoothed out to make an object of the mundane world — such as the optical pulsar — are not so pesky in the case of a formal entity since their behavior is “entirely dictated”, as they say, by their definition. There are of course many gaps⁶ (if not there would be no gain in the demonstration), but it is always possible to jump over each of those breaks after having retraced your path without having to draw on any other domain. No one has shown this better than Reviel Netz with the magnificent example of Greek geometry when he follows how this “miracle” — there is no other word — was made possible by the discovery of a highly specific scripto-visual procedure.⁷

“I suggest therefore that one part of the answer to ‘why are Greek mathematical proofs the way they are?’ is that proofs are compartmentalized from broader discussions, so that their structure is wholly autonomous. When doing mathematics, one does nothing else. Instead of the multidimensional structure of interests and implications of natural discourse, Greek mathematics abstracts mathematical relationships. This is perhaps obvious for a science, but the Greek mathematics had no earlier science to imitate in this respect. (p. 214)”

“When doing mathematics, one does nothing else”. Unfortunately, that’s exactly what Plato did not limit himself to doing, hence the

⁶ Bryan Rotman. *Ad Infinitum. The Ghost in Turing Machine. Taking God out of Mathematics and Putting the Body Back In*. Stanford: Stanford University Press, 1993.

⁷ Reviel Netz. *The Shaping of Deduction in Greek Mathematics: A Study in Cognitive History*. Cambridge: Cambridge University Press, 2003.

invention, according to Netz, of a formalist definition of formalism that has generated so much confusion in philosophy and in politics. Formalism offers a formidable advantage but it does not make it that much different from what is done in all other fields of scholarship: it is just that formalism is simultaneously easier — no competence without performance — and more cumbersome — you have to stick to the path of the demonstration, step after step, without jumping out at any moment to use another source of information in case of a break in the chain. This makes for huge differences in skills but not for incompatibility between domains. In that sense, formalism is scholarship too.

Such a common ground seems to me more realistic than the usual division between “nomothetic” and “idiographic” disciplines, or the more refined distinctions offered by Ian Hacking about various “styles of reasoning”. Is there really such an opposition between the sciences of nature and those of interpretation? I have followed scientists around for nearly forty years and I have never seen one that did not have to *interpret* the many disjointed traces that had been assembled to turn a set of performances into a competence. No scholar deduces as an automaton, thus scientists are all brothers and sisters of exegesis, the mother of all interpretative skills (the grandmother being this reading of delicate traces that Tim Ingold, the anthropologist, has so cleverly taught us to follow).⁸ Scholarship and interpretation are what a university should be made of.

What makes scholars believe they are in different camps is that their respective writings are opaque to one another. And it is true that all those different forms of opacity may be exaggerated: technical jargon risks proliferating either by needlessly multiplying the acronyms and the Greco-Latin gibberish or by multiplying paragraphs and playing with words and etymologies and non sequiturs, or by imposing a useless formalism when none is needed. But even this should not be derided because our common opponents, those, remember, who wish to get rid of whatever slows them down, have only one model in mind: they already know what the world is made of — who needs new agencies! — and how to register their behavior — clichés will do the job fairly well by unproblematically and immediately transporting their meaning to the other side of the planet. Powered by this source of energy that I call “Double Click” [DC], they think at lightning speed. No need for scare quotes, no need for new instruments, no need for literature, no need for humanities, no need for critical exegesis. “Don’t split hairs.”

⁸ Tim Ingold. *Lines: A Brief History*. London: Routledge, 2007.

I am afraid to say that we are all, those who work in laboratories as well as those who work in libraries, *hair splitters*. Splitting what is often as thin as a hair is the only way to make sure that behind the concepts and entities — the substance — there remain the long series of properties that make them subsist; and not the other way around. Never meet an actor without its networks. You may black-box them, but a black-box is not a cliché. The content of a black-box is fully *accountable*, to use Garfinkel's term, which in addition to being a philosophy of inquiry is also an ethic of research. So it seems that our *mot d'ordre* against the threat to the two cultures should be: "Hair splitters of all disciplines, unite!"

Before resuming my efforts at splitting even more hairs, I want to offer you the opportunity of a little crib to make sure that you are still with me. I will use this old example proposed by Françoise Bastide, a physiologist turned semiotician of the Greimassian school, whose work on the inner mechanism of scientific paper has been very important for me and deserves to be much better known. The test is fairly simple: can you detect what is common to those two paragraphs?⁹

[3] The procession slowly progressed through the winding streets of the old city. From high up in the belfry, I was easily able to distinguish the little scouts, the musicians and the Sons of France, and the men from the church council carrying the canopy. The crowd was lined along each pavement and although most were only Sunday believers, they listened quietly as the Daughters of Mary passed praying. However I noticed that at every street corner the scouts, who were impatient to get a bite to eat at the chaplain's headquarters, threaded their way with difficulty through the loiterers. They passed from one street to the next, shortcutting the procession, and then dispersed towards the fun fair. Moving from the main streets to the alleys, the procession lost its children and little by little was whittled down to a core of pious but middle-aged souls.

[4] The results detailed can be perfectly explained if one accepts the hypothesis that the walls of the vascular and urinary hairpins are much more permeable to water than to sodium. This would generate a counter-current water exchange between the ascending and descending limbs. If the walls of the ducts are more

⁹ Bruno Latour, and Françoise Bastide. "Writing Science - Fact and Fiction." *Mapping the Dynamics of Science and Technology*. Eds. Callon, Michel, John Law and Arie Rip. London: Macmillan, 1986. 51-66.

permeable to water, “transversal diffusion” should cause a fraction of marked water molecules circulating in the descending limbs to pass into the ascending ones by exchange at each level.

Hamster kidney	old city
Counter-current hairpins alleys	winding
Duct walls	assembled crowd

I am sure you had no difficulty passing this little exam: right, two different narratives, one single tree of action. Whereas in the first story what is slowly being concentrated through the meandering streets of my native city of Beaune, in Burgundy, are the pious souls of the “Daughters of Mary”; in the second what is being slowly concentrated through the counter-current of hamster kidney hairpins, is the “sodium”. In the first paragraph what leaks away at every corner are the little scouts while in the second it’s radioactively tagged water. Through the apparent distinction between some episodes of the writer’s early life and a serious scientific paper, runs a common set of forces.

This is where the distinction of actant and actor becomes visible. Superficially there is no resemblance between a city and a kidney, but if you consider the more abstract movement of progressive concentration through an ascending and descending mechanism of some sort, they can receive alternative figures. And it is not even the case that the second could be taken as more esoteric than the first, because if it is true that “transversal diffusion” might be a term known only by physiologists (and also by plumbers, they know a lot about the counter-currents of heat exchangers!), I am sure that none of you has any idea of what “Fils de France” could mean — as to the “Daughters of Mary” this is, I am afraid, a pretty local and by now totally vanished religious association of my youth.

There is of course a crucial difference between the two narratives well underlined by Bastide: The author-delegated observer in the belfry is endowed with the capacity of eyeballing the whole phenomenon as one *continuous* stretch while the physiologist is to reconstruct in time the flow of sodium in the kidney by keeping the traces of many hamsters killed in succession and reconstructing the virtual destiny of one sodium procession by a set of freeze frames taken at different intervals. The advantage of the writer of the first story is that we have no difficulty imagining the movement of a procession (we rely on similar examples even without knowing the city of Beaune) while the writer of the second has to make the reader imagine the smooth process out of a succession of split images that have to be shown in a table. Here

again we notice, just as much as in the optical pulsar case, that whenever the phenomenon is invisible the only way to register it is to fall back on even simpler perceptive judgments and a set of simple conventions (reading frames from left to right just as in comic strip; connecting the dots and comparing the different areas). In cases of processes or processions, movement is imagined: without fiction [FIC] no science would be possible.

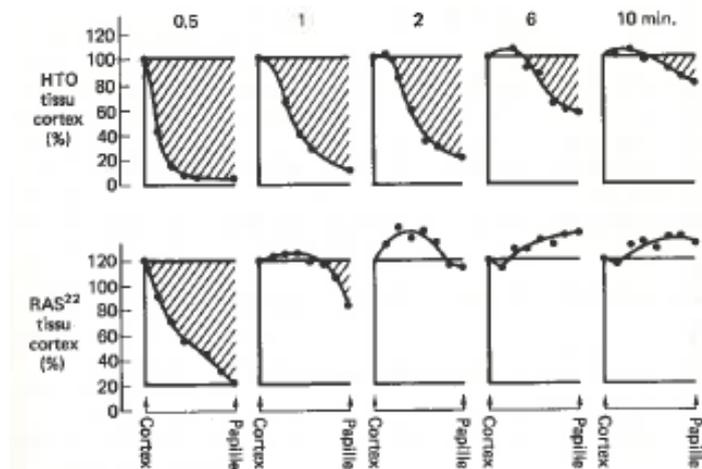


FIGURE 4.1 Turnover, with time, of water and sodium in the different regions of the kidney (redrawn from the original).
 Abscissa: the different regions of the kidney as defined in Table 4.1.
 Ordinates: top: the radioactivity of tissue water (i.p.m./mg) expressed as a percentage of that in the cortex; bottom: the specific radioactivity of sodium (i.p.m./ $\mu\text{g Na}$) expressed as a percentage of that in the cortex. The numbers at the top of the figure indicate for each curve the time interval (min) between the injection of the isotopes and the removal of the kidney.

This little example might seem too trivial, but I ask you to take it as a mere sign post that designates, below the apparently vast distinction between, let's say, science and literature, objective statement and narratives, something else that I call, for want of an accepted term, the *metamorphic zone* out of which all agencies emerge. In my jargon, the prefix "meta" simply means that in addition to the anthropomorphic characters — the scouts, the Daughters of Mary — and the physio-morphic characters — the counter-current, the sodium, the radioactively-tagged water, there is something else that defines their role and distributes their movement, a something that has to be at work before this division and on which the shape — hence the word "morphic" — of things narrated always depend. In the following lecture, I will try to render this concept more precise.

Metamorphic also designates the place, the locus of the *shape-changers*, those who are able to shift roles and figures around and to give

form to the phenomena they address — or rather by whom they are traversed. Unfortunately we have only the audio-tape of the discovery of the optical pulsar, but it would have been even more telling to have the video record of their *gestures*. When scientists explain what they do — and it is the same whether they talk of mathematical objects, natural science, social sciences or humanities — their gestures designate exactly this locus where totally different registers exchange their properties. As Patrick Blackett said:

The experimental physicist is a jack-of-all-trades, a versatile but amateur craftsman. He must blow glass and turn metal, carpenter, photograph, wire electric circuits and be a master of gadgets of all kinds; he may find invaluable a training as an engineer and can profit always by utilizing his gifts as a mathematician. In such activities will he be engaged for three quarters of his working day. During the rest he must be a physicist, that is, **he must cultivate an intimacy with the physical world.**¹⁰

Scientists at work take upon themselves, literally upon their own flesh, the forces that traverse them and for which there would be no name without their making them act. They become black holes, ancient empires, exotic rituals, profound concepts, or rather they give those entities the agency they would not have had without their creating this place of exchange. This is why I have never thought that objectivity and subjectivity could make sense of scientific discovery.

Amazingly, this place of exchange is even more visible when the scientist cannot make any gesture, not even speak, as H el ene Mialet has demonstrated in her study of the physicist Stephen Hawking imprisoned in his wheel chair.¹¹ In his case, even to “gesture toward a black hole” is possible only through the activation of a vast organization of instruments, speech synthesizers, nurses, doctors, helpers, and translators, thus merging together, in one single entity, the body of the active scientist with the institution of science, hence the title of her book “Hawking incorporated”. The most immaterial and the most material are fused together; the largest cosmic order and the smallest office in Cambridge are connected. This is a beautiful example of the *wave front* we have already encountered.

¹⁰ Patrick Blackett, 'The craft of experimental physics', in Harold Wright (ed.), 'University studies' (London: Nicolson and Watson, 1933), pages 67-96

¹¹ H el ene Mialet. *Hawking Incorporated*. Chicago: The University of Chicago Press, 2012.

The problem is that it is very difficult to concentrate attention on such a metamorphic zone without losing sight of it. In addition, I am very conscious that the word "narrative" and, even worse, the word "story-telling" would not pass muster with natural scientists even if they accept terms like "interpretation", "exegesis" and "scholarship" that I have proposed as a common umbrella for all the disciplines assembled in a university (a university, that is, of hair splitters...). As soon as an entity has been transformed into a substance — namely, as soon as it has shifted and reversed from a name of actions into a name of objects, from an "it" to a "this", from a "performance" to a "competence" — immediately the substance goes away in time and in space and now is impossible to connect to its discoverers (except when they are requested so as to cash in prizes and awards...). This is what Garfinkel has coded with the word "Galilean" no doubt borrowed from Husserl, but "Platonic" would have pointed to the same transformation.

This a delicate passage and I am going to ask you to be patient: *reductionism* can mean at least two different things, one is the reduction of a substance to its attributes; the other is the substitution of the substance for the attributes. The two meanings go in entirely different directions. Reductionism, in the first meaning, is the common property of all disciplines of scholarship: whenever we have an agency, we need to be able to retrieve the set of actions out of which it has emerged as an agent. This is what is meant by the expression of "being accountable" and, once again, it is also what James has defined as the main tenet of pragmatism. This is true for an odd concept such as "differance" in Derrida's jargon as well as for the many pathways through which a gene is able to act or for a definition of the Higgs boson. You have to show what it does if you wish to say what it is. We call scholars or scientists those who are able to describe through their attributes the agencies with which they populate the world — that is, through some sorts of trials. The problem is that reductionism, now in the second meaning, is just the opposite: as soon as you have the agency you may feel you are now allowed to *dispense* entirely with linking it to the list of actions of which it is no longer the summary but now the source. In the first sense, reductionism is the glory of all sciences; in the second it is the bane of science, what has generated what is often called "the scientific world view" and what has discouraged so many people from engaging in research. One meaning makes you, so to speak, "friends of interpretable objects";¹² the other makes you someone who thinks that

¹² Miguel Tamen. *Friends of Interpretable Objects*. Cambridge, Mass: Harvard University Press, 2001.

the task of describing may be dispensed with. In one version you are fully accountable; in the other you are no longer accountable.

In a famous sentence from the *Concept of Nature*, Whitehead demanded that we differentiate the two meanings of reductionism when he said:¹³

“For natural philosophy everything perceived is in nature. We may not pick and choose. For us the red glow of the sunset should be as much part of nature as are the molecules and electric waves by which men of science would explain the phenomenon. It is for natural philosophy to analyze how these various elements of nature are connected.” p 29

If we “may not pick and choose” it is because the registration of one phenomenon cannot erase from the world the registration of any other one: once “red” has been retro-engineered into “electric waves”, the “glow of the sunset” is still *there* with all its properties begging for a description. A world of glowing sunsets without electric waves would be, indeed, a tragically impoverished world, but so would be one where “electric waves” would have “eliminated” the glory of sunsets (“eliminativism” is the philosophical equivalent of what is called in geopolitics “ethnic cleansing”). This is where the two meanings of reductionism crash into one another.

To end this first lecture, let me give you an example, exactly similar to the conflict between “red” and “sunset”, but where the situation is not imagined by some armchair philosopher but built as what I call a “diplomatic encounter”. In the *Inquiry on Modes of Existence* that I have launched, we multiply those kinds of situations where the claim of one description is no longer able to eliminate from existence the claim of another description. Not because of any indifference to truth — what people often call “relativism” — but for the exact opposite reason: namely, to register more reality thanks to the use of a larger number of templates. Pluralism is here understood not as a plurality of points of view on the same reality but as a multiplicity of types of agencies to register more reality — hence the phrase “mode of existence”.

I am sure you had the experience that when people use as their template the so-called MindBody it becomes very hard not to “pick and choose”. Inevitably their hands begin to dance from left to right involuntarily as if in a sort of trance, “either” it is the Mind “or” it is the Body, or it is some sort of “psycho-somatic” mix of the two. So, this is

¹³ Alfred North Whitehead. *Concept of Nature*. Cambridge: Cambridge University Press, 1920.

why, in February of this year, I arranged a situation where it was just as impossible to describe a phenomenon by using the MindBody pincer as for the “Fox and Stork” of the fable to eat out of each other’s dish.

The case participants had chosen was that of Huntington chorea, a “degenerative” condition caused by one single dominant gene, for which there is a test but not a cure. Huntington chorea is thus an ideal candidate for playing the role of the “Body”, I mean the causal body so much loved by reductionists of the second category: one gene, one condition, sure death.¹⁴ However, we had complicated the matter by having, among the participants, two representatives of a very original patient organization, called Dingdingdong (DDD), Emilie Hermant and Valérie Pihet.¹⁵ Normally, what is expected from patients is that they occupy the position of those who suffer in their flesh — flesh or body? — and that they state the lived experience they have of the disease — or that they complain about the lack of funding for research, or the bad ways in which Social Security reimburses them for their expenses. But those two, inspired by AIDS activists, claim to generate knowledge about the Huntington disease and not just a subjective interpretation of what it is to live through the disease. Emilie and Valérie have created no less than a “research institute”!

Now, we complicated the situation even further, by inviting a brain scientist of great reputation, Allan Tobin, who himself had had an important role in the discovery of the gene and in following the pathways through which the disease is being activated in the brain. As is always the case when you come closer to research, scientists are not eliminativists: sure enough, Allan began to let the genetic makeup, and then the brain connection, to proliferate in all sorts of unexpected directions. The action of the gene, even in this case, is not a straightforward affair: it opens many avenues. Soon the activists of DDD and the brain scientist began to talk to one another and apply the maxim “in natural philosophy we cannot pick and choose”. Gone was the MindBody pincer.

¹⁴ <http://www.modesofexistence.org/workshop-met-mindbody-a-report/>

¹⁵ <http://dingdingdong.org> Dingdingdong Manifesto (translated by Damien Bright), Paris, 20xx.



Especially because I had, somewhat disingenuously, complicated the situation still further by adding to the feast another table companion, the ethnopsychiatrist Tobie Nathan, a disciple of Georges Devereux (maybe some of you have seen *Jimmy P. Psychotherapy of a Plains Indian* by Arnaud Desplechin where the forgotten figure of Devereux has been resurrected by the camera). So when the first guests had entered into the discussion of “involuntary movements” — what is called a “chorea” and what has given its name to the Huntington disease — and when they had begun to realize that the “scientific” notion of involuntary movement was opened to question, Tobie, as if he had been bitten by a spider, suddenly recounted the story of the Tarentella, this dance, ritual and therapeutic music of southern Italy.

It turned out that Valerie had participated in a dance class opened to Huntington patients and where step by step what was supposed to be a “pathological” dance and what was supposed to be a “recreational” or “artistic” dance had begun to merge. What it is to “have” such a disease, that is to be traversed by those movements, was opened to redescription. To the gene was added many other agencies that make the patients move. It became impossible to “pick and choose”. We found ourselves in a completely different situation than what would have been expected from using MindBody as our template. And of course, here was also a very different moral situation since it would have been inconceivable now to tell someone who had just learned that they carry the gene that causes Huntington chorea (remember that there is a test but not the slightest cure) that: “Sorry, this is a degenerative condition ending up in dementia and sure death. This is your fate”. “Degenerative” might not be in the end the exact word to describe Huntington. There is a poison in MindBody that DDD has

tried to extract from the *description*, yes the description, of the disease. At this point, natural philosophy meets politics.

At the end of this lecture on agency, we have two definitions of what it is to do research and to be “friends of interpretable objects”: one is to be hair splitters, the other “not to pick and choose”. The next task is to abide by Whitehead’s injunction: “It is for natural philosophy to analyze how *these various elements of nature are connected*.” In the end, the old and respectable term “natural philosophy” might be the best umbrella for a university. It is a great irony that the massive movement to discipline, disrupt and weaken basic science as well as humanities is being made in the name of “accountability”. Because, if you have followed me, being accountable means exactly the opposite of what evaluators, administrators and financiers say it is: it is not to prove how useful research is, how quickly it turns into a profit, how efficient it is for designing a product, but how securely we are all able to attach the definition of an agent acting in the world to the set of properties that defines such an agent. I should modify the motto I offered earlier: “Against those who pick and choose, hair splitters of all trades and countries unite!”

Tanner two — ontology

In the lecture yesterday I tried to offer a common denominator for the various domains of scholarship by building upon the notion of agency. I claimed that scholars, whatever the many differences in the skills they master, are those who try to make sure that when an agent is introduced into the world, its *disposition* (or its competence, its substance, its essence — the word does not matter too much) is always connected with its *action* (or its performances, or its actualities, its attributes, its properties — here again the word does not matter). Such a connection ascertains that it is always possible to move from the *trials* through which the properties have been slowly assembled to the *essence* of a phenomenon — or, conversely, from its essence back to the situated, mundane, material set up out of which it has emerged. I argued that it is this double connection that ensures the *accountability* of a discipline. And in addition I claimed, maybe too polemically, that such a way of being accountable has not much to do with that which is the enemy of scholarship as well of basic research, "evaluation" — which means filling in forms so that you may be made redundant faster and with less protestation...

The tools I offered yesterday come from semiotics broadly conceived, that is, from an attention to the *textuality* of the accounts provided by the many disciplines of natural philosophy or of scholarship. Even though it is slightly irritating for many scientists to be reminded of such an elementary fact, they all do *write accounts* of what has happened in the various set-ups they have built with great care and at great expense. This is true no matter if they deal with the mathematical formalism of ant colonies, expeditions on the canopies of the Amazon forest, visualization of neuron firing in the hippocampus, survey research on gender discrimination, etymology of the word "pragmaton" in Aristotle's philosophy or the immensely long history of air bubbles trapped in Antarctic ice cores. They all have, in the end, to write a report. It is this common concentration on the production, assemblage, collation, gloss and summary of textual documents that allows all of us, as members of what I still want to call a "university",

inside our various *scriptoria* (or better “*screentoria*”!) to say that we are the sons and daughters of *exegesis* — so many scribes interpreting the traces left on disjointed documents through the careful application of our shared interpretative skills.¹⁶

There are at least two reasons why I think it is important to stitch back together the Harlequin’s coat of the old university and to bring slightly closer together the “friends of interpretable objects” whichever part of campus they come from.

The first reason, proper to semiotics, is that it allows us to focus attention not simply on the literary or narrative aspects of the scientific literature (a useful thing in itself) but on what I have proposed to call the *metamorphic zone* where humans and non-humans keep exchanging their properties, that is, their figurations. A non-anthropomorphic character is a character all the same. It has agency. It moves. It undergoes trials. It elicits reactions. It becomes describable. This, however, does not mean that we are “projecting” anthropomorphic features on what should remain an object: it simply means that the shape, that is, the *morphism* of the human character is just as open to inquiry, to shape-changing, as that of a non-human. Put more bluntly, it means that the older philosophical tools of object and subject are wholly inadequate to follow the many descriptions, the many accounts that are pouring out of our *scriptoria* — be they laboratories, offices, studios or libraries. Here, something else is at work, has always been at work, something that does modify the shapes of whichever ingredient you throw inside, much like a fiercely boiling sorcerers’ cauldron.

The second reason to try to repair Harlequin's shredded mantle is what I called a new political or more adequately a new diplomatic situation. As I showed at the end of the lecture yesterday, “we cannot pick and choose” because the older contract that had distributed the domains of scholarship — to natural scientists the objective natural world, to the rest of the disciplines the more subjective aspects of human life —, this contract has been destroyed by the very advance of human intervention in the elementary features of our terrestrial existence. What had earlier been a mere epistemological question: “How is the human mind able to know the world objectively?” has become a totally practical question: “How can we describe life on Earth

¹⁶ An amusing example of this common exegetical language is offered by the physicist Karim Benabed after having heard of the presentation by John Kovac and Clement Bryke on the gravitational waves at the moment of the Big Bang detected by Bicep2 after having recognised that it was an exciting and major discovery: “We are going to look at every comma of their paper...”. Shifting attention from the traces of the Big Bang to the commas in the paper, is adding two exegetical skills on top of one another. Le Monde 19 mars 2014 science supplement.

in which human traces — not to say leftovers — are so ubiquitous that natural and artificial have become impossible to set apart”? The convenient although controversial term to register this new historical situation is itself a fascinating hybrid of geology and politics, namely the word *Anthropocene* (this epoch of the Earth history during which humans, taken as a whole, have become, at least this is what stratigraphers suggest, the most important geological force at work). That’s the name of the sorcerer’s cauldron. At the time of the Anthropocene, now that history has become geostory, the very shape of humans and non-humans have all to be remixed. Hence the necessity of entirely re-stitching the geopolitics map of the many disciplines in charge of studying such a mixture. It is no longer in the power of one description to eliminate alternative descriptions without trial. They may be in conflict, but they cannot be annihilated. They have to compose, maybe to compromise.

Before we dive head first into the difficult topic for today, let us stroke the flanks of the cauldron to check how hot it is. A recently written op-ed in the *New York Times*, “If you see something, say something”,¹⁷ will help me show where the problem resides. Michael E. Mann is the author of a book the title of which is a perfect symptom of the period I am pointing at: *The Hockey Stick and the Climate Wars: Dispatches from the Front Lines*. Apparently, news coming from science have become comparable to those from the trenches of Guadalcanal or Verdun!

In my view, it is no longer acceptable for scientists to remain on the side lines. I should know. I had no choice but to enter the fray. I was hounded by elected officials, threatened with violence and more — after a single study I co-wrote a decade and a half ago found that the Northern Hemisphere’s average warmth had no precedent in at least the past 1,000 years. (...) This activist approach has concerned some scientists, even those who have been outspoken on climate change (...) Should we resist commenting on the implications of our science? (...) If scientists choose not to engage in the public debate, we leave a vacuum that will be filled by those whose agenda is one of short-term self-interest. There is a great cost to society if scientists fail to participate in the larger conversation — if we do not do all we can to ensure that the policy debate is informed by an honest assessment of the risks. In fact, it would be an abrogation of our responsibility to society if we remained quiet in the face of such a

¹⁷ NYT January 17th 2014.

grave threat. (...) This is hardly a radical position. Our Department of Homeland Security has urged citizens to report anything dangerous they witness: "If you see something, say something." We scientists are citizens, too, and, in climate change, we see a clear and present danger.

What is especially interesting in this op-ed — and also very moving —, is that Michael Mann is simultaneously trying to extricate himself from an older settlement (there should be a fire wall to keep science and politics apart) while having the utmost difficulty in articulating an alternative (we risk playing the role of the activists that our enemies — the deniers of climate mutation — denounce; but if we fail "to get into the fray" we run the symmetric risk of abandoning our duties as scientists which is to warn people of the dangers surrounding them that we have detected).

What is for me very revealing in this example — and hundreds more could be easily found — is that, to his surprise, Michael Mann is dealing with types of statements that are crossing over the distinction between facts and values: it is about things that are there, that are dangerous, that are denied by enemies and that should be told to the public. No wonder that in the title of his book he has to resort to the expression "dispatches from the front line". What is supposed to be peacefully gathered — namely, facts about some state of affairs out there looked at *dispassionately* by people who are entirely *disposable* once they have made the discovery—, those facts have become the front lines of conflicts where discoverers, their feet deep in the mud of the trenches, are fully visible, fully accountable and without any escape route to the Rear (*l'Arrière*). Now we risk being at war about *what is in the world*; as to the discoverers, they are very much in the fray and would share the responsibility if the public were to be defeated. What in previous work I had registered as a shift from "matters of fact" to "matters of concern" has taken on an added intensity, stridency and urgency. It is at this point that the question of agency meets those of politics.

Well, since we are talking about front lines, I don't want to hide that I wish to help the Michael Manns of this world. I, too, wish to heed the warning: "If you see something, say something!". To do so, however, means that, as I had planned earlier, we have to shift our analysis of agency from semiotics to ontology.

It is not without qualms that I introduce this word here, since I am well aware that "ontology" is one of those scare words that frighten away many colleagues. Which is strange, if you think of it: natural scientists are the last ones who should deem it an odd term since they have no qualms whatsoever in stating, through their writings, what

things are, which is exactly what the word “ontology” means: “the study of what is”. And yet by bringing in the word ontology (and that would be the same with the word “metaphysics”), it is true that philosophers introduce a warning, a trouble, some sort of disquiet, of restlessness about what things are. As if they were not so sure that those things are what they are! Well, this is just the effect I wish to convey, especially if we have to deal with those sorts of proliferating hybrids that seem to be stating simultaneously what is and how we should behave when meeting them.

To smooth things out a bit, I will use the word ontology in a sense slightly different from the common usage: not as the science of being but in a sense closer to its etymological neighbor *deontology*. I will define *deontology* as the diplomatic care with which we collectively come to grips with what is and what should be assembled in the world. *Deontology* is the skill necessary, in my jargon, to move towards the tasks of *composition*. It is very much a consequence of what I have called earlier “being accountable”.

I am afraid that the operation I have to accomplish now is fairly delicate — and I remind you that it remains totally speculative. We have to render ourselves able to come to grips with what is experienced in the world. However, we have been warned above that it is very unlikely that we will encounter those entities, those agents, under the form of objects known by a subject — the older settlement corresponding to “matters of fact”. If we cannot “pick and choose”, it is because entities are given in experience through many other modes. This is why one type of description cannot eliminate another type. Remember Whitehead’s interrogation of how to avoid the distinction between two experiences of how “red” is being given:

“The real question is, ‘When red is found in nature, what else is found there also?’ Namely we are asking for an analysis of the accompaniments in nature of the discovery of red in nature.” (p. 41).

His solution, well known through the commentary given by Isabelle Stengers,¹⁸ is fairly radical: “No perplexity concerning the object of knowledge can be solved by saying that there is a mind knowing it” (p. 28). In other words, epistemology will lead us nowhere. The question is not to have a world and then a human mind, but first a world whose various trajectories are grasped while freed from the added complication — Whitehead says the added “muddle” — of being known by someone.

¹⁸ Isabelle Stengers. *Thinking with Whitehead: A Free and Wild Creation of Concepts* (translated by Michael Chase). Cambridge, Mass: Harvard University Press, 2011.

You might have already heard this famous sentence from *Concept of Nature*:

"My argument is that this *dragging in of the mind* as making additions of its own to the thing posited for knowledge by sense-awareness is merely a way of *shirking* the problem of natural philosophy. That problem is to discuss the relations *inter se* of things known, *abstracted* from the bare fact that they are known." (... "Natural philosophy should never ask, what is in the mind and what is in nature." (p. 30)

Now you might be surprised to see this quote being celebrated by someone who claims to be loyal to the field of science studies. What this field has accomplished, on the face of it, is exactly the opposite of what is requested here by Whitehead. Have we not "dragged in" not only the mind, but also all trappings of scientists at work: their instruments, their laboratories, their grant application, their politics, and to top it all, as I just did a minute ago, their writings, documents, papers and inscriptions of all sorts. If there are people who "have caused the muddle of importing the mere procedure of thought into the fact of nature" (p. 20), is it not those writers from science studies? As I said above, the situation has been confused to the point where it is now impossible to "discuss the relations *inter se* of things known, abstracted from the bare fact that they are known". In that sense, science studies, in spite of its longstanding polemics against epistemology, seems to play, in the end, exactly the same role. As if the Greek etymology of the latter had caught up with its English translation. Science studies, then, is the mere replay of epistemology — the mind is dragged in, with more paraphernalia to be sure, but the muddle is just as thorough.

Whitehead's project, however, was not to push the mind aside in order to gain some primeval access to a word of "nature", but to make sure that we do not confuse the entities which are encountered in experience with the "additions", the *extra work* to be done in order to grasp them as things known. Whitehead had realized that when we encounter an entity as an "object" we are actually encountered a hybrid made of at least two *entirely different layers*: one which is "sense-awareness" and whose trajectory is accessible through what he calls "the passage of nature"; and the other which is the "procedure of mind" necessary to ensure the movement of another trajectory, that of "discursive knowledge". It is by distinguishing those two trajectories that he is able to show that what is often taken to be the "material world" is not an autochthone, aboriginal stuff encountered in experience, but the idealist product of an amalgam between at least two kinds of experiences. Those two should be clarified first in order for any

natural philosophy to fulfill its duty, namely, “to analyze how these various elements of nature are connected.” Hence Whitehead’s well-known quote where materialism is revealed as a fully idealistic rendering of experience:

“Thus what is a mere procedure of mind in the translation of sense-awareness into discursive knowledge has been transmuted into a fundamental character of nature. In this way matter has emerged as being the metaphysical substratum of its properties, and the course of nature is interpreted as the history of matter.” P. 16

Half of the stuff out of which matter is conceived, is made of the manner through which we have access to some states of affairs. If we don't want to “shirk the problem of natural philosophy”, the question becomes how to make sure that when we encounter entities we don't immediately lose track of them by treating them as “object” — which would mean, if you have followed the argument, to direct our attention not toward the world but toward the mind. As William James would have said: we don't want more than what is experienced, but we don't want less either. “Object” is the wrong qualification for things in the world as well as for what it is for them to be known “objectively”.

This is where science studies, in spite of what I said above, could come in handy. If Whitehead’s argument seems so difficult to grasp, it is because it still deals with “the mind”, an abstraction just as unexamined as that of “matter”. As soon as we replace the mind by active professions of scientists at work in laboratories assembling the documents extracted from their instruments and writing accounts validated by the many scholarly institutions, it becomes much easier not to confuse such a trajectory with that of the passage of nature. The distinction between the “fundamental character of nature” and the many “procedures” to “translate” it into what is known is just too gaping. (In the language of the *Inquiry into modes of existence*, we recognize here the crucial crossing [REP.REF].)

This is just what I emphasized yesterday: a careful rendering by Garfinkel and his colleagues of how an optical pulsar had been discovered allowed them to detect the juncture at which the local situation of the astronomers was traversed by another historical route that later became construed as a Galilean object known by astronomy. When this juncture is carefully registered, it becomes possible not to muddle the two movements: that of how entities move into the world and that of how we gain access to them through our instrumentarium by localizing the exact locus where they cross one another. And this has nothing to do with a mind looking at a world of objects. Had we simply dragged the mind in, we would have missed this articulation; but when

we drag in the whole set of circumstances and material equipment, this time it can no longer be missed.

In other words, if we could succeed in fully localizing in the world the very activity of knowing, we might be able to simultaneously meet the *forward* movement of entities and the *counter-movement* of objectivity without mixing the two and without, for that, being forced to stick to the mind — or to this ersatz of mind that is called “social construction”. We would be able to come closer to what I have called in the former lecture the “wave front”. If we could do this, then science studies will render a service that epistemology has never delivered — or rather, science studies could offer the counter-poison to what epistemology had injected into philosophy...

Why is it so extraordinarily difficult to localize knowledge making; why is it so hard to specify knowledge as a mode of existence in the world and not a mode of existence of the world totally absent from the world, that is, *unaccountable*? I sometimes feel that I have been doing nothing else in the last forty years but pondering over this problem: respect for objective knowledge is possible only if it is fully localized — no matter how far it extends. And yet it seems to flee as soon as we consider it. So, if I want to have the slightest chance to make my point tonight — another try after so many tries! — I have to block all the *escape routes* through which objective knowledge flies away as soon as it is produced. It is the only manner to help not only Whitehead’s speculative philosophy to be better understood (it does not need me!) but also Michael Mann and his peers (those might need my help on their front lines — poor blokes lost in the Anthropocene and crying for help to other poor blokes like me, just as much lost, from the humanities departments...).

Since this is such a difficult point, let me take up a simple, almost trivial, example to get an idea of the movement we should try to counteract by another contrary move.

The other day, I was on a panel with a physicist, George Smoot, a Nobel Prize winner, one of the discoverers of cosmic microwave background radiation (if I tell you the name of the panel — “The cosmological function of art” — you will deduce immediately that it was in Paris — where else with such a title?). To summarize the advances of his science, Smoot showed to the audience of mostly literary people, a film that took us from the Earth all the way to the Big Bang *and back* through a carefully mounted mixture of data about galaxies gathered in his lab and digital special effects straight out of Hollywood. The possibility of moving backward all the way to 380.000 years after the Big Bang was of course stunning. And yet I could not help being ill at ease because what was shown as a film shot by some

character whose semiotic ectoplasm has been delegated almost 13 billions of years away into a universe totally different from what it is now, was not only a fiction — nothing wrong with that, Kepler had done it too to pave the way to astronomy¹⁹ — but also a complete misrepresentation of the work done by Smoot and his colleagues to assemble those very same data. Naturally, it was not a betrayal for Smoot himself since, as a specialist of the field, while we, the *hoi polloi*, gawked at the film, he was mentally *replacing* every smoothed picture by the thousand of hiatuses that had been necessary to overcome in order to mount such a fiction. For us, however, it was impossible not to be taken in while we were watching the Hollywood equivalent of the “scientific world view”.

To be sure, it was not a world of Galilean objects — the film was clearly advertised as an artist’s rendition — but still it was a narrative that exemplified all the bad habits of epistemology: knowledge was spirited out of a universe that it deployed in front of us in a way that made it totally impossible for the audience to replace the competence granted to any of the entities flying on the screen with the list of their performances. We had no way to break the narrative by “mental reservations”. In a word, the film made physics unaccountable. Not exactly a fraud, since many real data had been stitched together, but still as far as possible from how such a science had been produced. The result was that we were asked to witness a highly simplified example of the “muddle” denounced by Whitehead: the passage of nature was replaced by bits and pieces of data surreptitiously smoothed out by a narrative that made things just as unaccountable if taken as an artistic piece (it was not art) or as if considered as a science report (it was not science). And yet it appeared to be a realistic version of what the world in itself is supposed to look like, an example of this spurious realism that is associated with the notion of a “material world”. I already knew that a “scientific worldview” is indeed a view, a picture, but I had never realized so precisely that it should be called a “scientific worldshow”.

It is not very charitable of me to quibble about his film (especially because George Smoot is a great adept at making art from his science) but it allows me to point out that in addition to the localization of scientific practice in space and in institutions — a necessary task to which the whole of science studies has dedicated itself —, it is important to add its localization in time.

By this I don’t only mean the well-documented *inversion* that has been often noticed when facts-in-the-making become all-made-facts.²⁰

¹⁹ Frédérique Ait-Touati. *Fictions of the Cosmos: Science and Literature in the Seventeenth Century* (translated by Susan Emanuel). Chicago: The University of Chicago Press, 2012.

²⁰ Bruno Latour, and Steve Woolgar. *Laboratory Life. The Construction of*

The slow erasure of the scientists at work makes a lot of sense: once the fact is established, there is no more reason to parade the discoverers than for the author of the novel to signal at each page that he or she is the author of the novel (except for some special effects). Rather, I am interested in what it means for the procedure of science to take place *after* the phenomena they encounter, and then to retrofit the encounter as if science had taken place *before* the phenomenon but in an invisible and unknown fashion. So I want to distinguish the two movements: one that makes possible an access to what is far away; the other that reorganizes the movement as if it was coming from the far away to now. What happens when we develop, that is, when we narrate, the unfolding of some knowledge, not as it has been discovered, that is, from its consequences, or, more exactly its performances, but by starting from its causes. In other words, what is achieved when we tell causes-and-consequences stories?

To give some respectable patina to my case, I will turn to Descartes' magnificent claim, in the *Discourse on Method*, that, without any prior experience, he had *deduced from first principles* the existence of the Earth! Here is a story even more grandiose than Smoot's travel to the Big Bang and back:

First, I have essayed to find in general the principles, or first causes of all that is or can be in the world, without taking into consideration for this end anything but God himself who has created it, and without deducing them from any other source than from certain germs of truths naturally existing in our minds. In the second place, I examined what were the first and most ordinary effects that could be deduced from these causes; and it appears to me that, in this way, I have found heavens, stars, an earth, and even on the earth water, air, fire, minerals, and some other things of this kind, which of all others are the most common and simple, and hence the easiest to know.²¹

Scientific Facts (second edition with a new postword). Princeton: Princeton University Press, 1979 1986.

²¹ "J'ai tâché de trouver en général les principes ou premières causes de tout ce qui est ou qui peut être dans le monde sans rien considérer pour cet effet que Dieu seul qui l'a créé et les tirer d'ailleurs que de certaines semences de vérité qui sont naturellement en nos âmes. Après cela j'ai examiné quels étaient les premiers et les plus ordinaires effets que l'on pouvait déduire de ces causes, et il me semble que par là j'ai trouvé des cieux, des astres, une terre, et même sur la terre de l'eau, de l'air, du feu, des minéraux et quelques autres choses, qui sont les plus communes de toutes et les plus simples et par conséquent les plus aisées à connaître" (*Discours de la méthode*, partie 2)

As Charles Péguy comments rather jocularly in his equally magnificent *Note conjointe sur monsieur Descartes*:

«Has there ever been such a beautiful audacity, such a comparable movement of thought to that of this Frenchman ‘who has found a sky’? And not only a sky. He has deduced stars and even an Earth. (...) We know very well that he would never have found Heaven and Earth if he had not heard of them first. (...) It does not matter, Descartes, in the history of thought, will always be this French horseman who started off at such a good pace”²² (“Descartes sera toujours ce cavalier français qui partit d’un si bon pas”).

Yes, no doubt the pace is admirable, the audacity magnificent, and yet there is something deeply troubling in making all phenomena the belated consequences of the “laws of nature”. As soon as you claim that the agencies encountered in experience “obey a law”, immediately the law takes over the role of the substance, of the competence, while what happens, that is the set of properties, of performances, are *retrograded* to the status of mere phenomena of mere appearances — the etymology says it all — what could, ideally, be dispensed with, once we have grasped the law that “governs” them. Through the veil of appearance, you could see the hard substantial core of what makes them what they are.

What is troubling, is that this has nothing to do with the ways laws — now in the legal sense — accomplish their own peculiar movement forward; and nothing either with the meaning of law in politics; and naturally, nothing either with the ways they are generated and extracted in scientific practice. Strangely enough, the laws of nature seem to “govern” phenomena without their “sovereignty” having the legal, political and scientific foundation they deserve. Apparently, that was not a problem during the period of modernism, but it has become a crucial issue now that we are said to live at the geohistorical epoch of the Anthropocene. We absolutely want to know what is the sovereign we are to obey and what are its legal, scientific and political credentials. That’s the problem Michael Mann and many others are struggling with; that’s what they cry for from their front lines: “Under which laws are we fighting? For what sovereign are we asked to sacrifice our career — maybe our life?”

One could say that, because of the constraints of language, any report, any account has to state first the causes and then the consequences. That it is perfectly normal to place the actor endowed

²² Charles Péguy *Note conjointe sur Monsieur Descartes*, T.III Pléiade p. 1279.

with the role of the “cause” before those playing the role of “consequences” even though everyone knows perfectly well that, every time, consequences have been grasped long before their causes. In one narrative the Earth and the sky is obviously there long before the “seeds of truth that are naturally in our souls” and it is just fairly convenient to tell the story “as if”, from the first principles, the Earth and the Sky could be simply *deduced*. Every one knows that, Smoot just as well as Descartes. And yet, what is perfectly well known is just as perfectly well forgotten.

This is why I think that it would be too reassuring to say that there is nothing more in this appeal to the laws of nature, in this inversion of antecedent and consequent, than some innocent *montage*. There is nothing innocent in such an apparently innocuous inversion because, through such an inversion, something crucial has been lost and something equally crucial has been *added*.

What has been *added* is that the phenomenon is now running from its cause to its consequences along a pavement that is made of all the instruments, inscriptions, formalisms that had to be generated, one after the other, to gain access to it — but in the reverse order. The result is that just as with Smoot’s or Descartes’ special effect scenarios, all the hiatuses that had to be cleared, one after the other, for the scientists to go from their observatory to the invisible far away state of affairs, are now smoothed over and transformed into a perfectly regular and unproblematic trajectory gliding from the cause to its consequences. Hiatuses have disappeared but the stuff out of which they are made is still there playing now the role of a tarmac, so to speak, where phenomena can now land as so many mechanical planes (this is a more concrete rendering of what Whitehead called “psychic additions”).

The problem is that the *same conduit* through which access to the far away had been gained is also used as the conduit employed to bring them back. Except that now, on their return journey, they are behaving as “known entities”. This is why they are called “Galilean objects”: to remain in existence as durable entities, they no longer have to make any effort [REP], if I can say so, but simply to confide their durability to the ways through which they have been accessed [REF]— except that now all the obstacles are now impossible to notice since all traces of knowledge in the making have been erased. The “procedure of the mind” has become the very *stuff* in which what is known also resides. Everything happens as if, from now on, entities of the world, once they are known, were made “in knowledge”. Knowledge in the world becomes knowledge of a world, a world of which Science (capital S) has become the absentee landlord.

If I now turn to what has been lost, you might recognize why there is nothing innocent in those “scientific worldshows”. What has been lost is the possibility to encounter in experience entities of the world in any other mode than the one of objective knowledge. This in itself would not be a problem if by “objective knowledge” we mean the *forward movement* of accessing what is far away and invisible. On the contrary, it would be truly magnificent. Adding knowledge to the world, what better way is there to fulfill one’s vocation as a scholar? But it is a big problem if by “objective knowledge” is also meant the *return journey* where knowledge has become the conduit where *what it is to know* something has entirely vanished. Now we are facing a spurious reality — a phantom — where it is impossible to distinguish in the entities we encounter how things stand in the world and what we have to do to access them objectively. Once they are entirely made “in knowledge”, how to know them has become impossible to retrieve. (In my own parlance the two opposite meanings of “immutable mobiles” have been mixed, the positive one for the access, the negative one for the return trip.) Now, strangely enough, just at the moment when everything seems to be made “of” or “in” knowledge, it is knowledge that has been withdrawn from the world.

Especially problematic is the role given to scientists: when things come back on their return journey, the only way to follow them is to become yourself a Galilean object, that is, a Galilean *subject*. You now have to believe that your cognitive abilities, your own body, the genes out of which you are made, all of those entities are themselves made of the same stuff as “objective knowledge”. The phantom of objectivity, by contamination, leaves in its wake, a phantom of subjectivity. Soon emerges the double ghost, MindBody, the only inhabitant of a deserted world. It smells like materialism except that it is nothing but the indefinite extension of an idealistic rendering of matter. Ontology has been so stabilized that there is no longer any room for any other encounter. If you compare knowledge-making to the chlorophyll function invented by plants to extract from the sun a power of development that did not exist before them, everything happens as if plants were imagining that the sun, the Earth, the universe all the way to the Big Bang were made exclusively of chlorophyll! A comfortable green dream, to be sure, but one that does not allow plants to encounter what is in the real world. Or, to take another metaphor, it is like imagining that clocks, under the pretext that their regular circular movement allows them to provide humans with an instrument to detect the passage of nature, were now fantasizing that all the movements of the world were made in the same tick tick tick as the one they go through. A nice dream for a clockmaker but one that would

make impossible to meet any entity of the real world — beginning with plants...

One of course could object that it does not matter much: Galileo himself was not a Galilean object! As to Descartes, he never believed for a minute that his body was a machine — witness his private letters and his careful attention to his diet. Practicing scientists are doing something entirely different from what they say the world is like when they project films in their world-showrooms. They all know that those shows are “for the public” and “to render things simpler” for mere pedagogical reasons. And no one will be silly enough to confuse the tick of a clock with the passage of nature. Well, once again, what everyone knows very well is also what everyone forgets just as quickly. Are not scientists often victims of their own “scientific worldviews”?

But I agree it makes not that much of a difference when we have to deal with optical pulsars or Big Bangs. The situation is entirely different, however, when what is encountered are entities that insist on being encountered on other grounds. This is especially the case when they have values, urgency, importance, intensity — all features that are not to be confused with that of being accessed through rectified knowledge. It is also the case when they pertain to what concerns the habitat inside which we all reside. In those cases it might be terribly important — maybe criminal — to miss the many other ways in which they request to be encountered. This might be the case when Michael Mann appeals to the “inconvenient truth” of the anthropic origin of climate change but also, if you remember the example with which I ended my lecture yesterday, of what it is to have a gene for Huntington chorea. There, the last thing you want would be to confuse how objective knowledge is extracted from the genes performances with how they insist on acting upon us. It is this insistence that the stabilized ontology of Galilean objects does not register. But it is exactly what I have called “deontology” should learn to counteract. An ontological quest (or a diplomatic encounter) should be placed just there to make sure that the return journey of Galilean objects may be interrupted whenever necessary. The world is no more made “in” knowledge than it is made “in” chlorophyll. It is being objectively knowable and it *has* life — at least on Earth — but that’s not a reason to confuse the two statements.

Let me now bring these two lectures to a close. From the time I was granted the honor of giving these Tanner Lectures, I have been worried by the umbrella term: “on human values”. I suspect that the usual way in which this appeal to “human value” is construed is that there exists an “objective world of material stuff” to which it would be really good of scholars in the humanities to be so kind as to add some

“supplement of soul”. Value, in such a view, is not a property of the valueless world but only of humans. “Human” is of course also much of the problem. It’s not an entity whose *shape* has been determined once and for all, especially when anthropology shifts so much at the time of the Anthropocene to the point of having to deal with human *qua* geology... How to stabilize the shape of those humans with the long trails of CO₂ they leave in their wake; the genes that so many laboratories running on biopower are multiplying every day; those digital prostheses that seem to be a more and more intimate part of them; those calculating devices to which they are so hooked that they end up behaving for good as an “*Homo oeconomicus*” — a figure just as bizarre as that of “*Homo geologicus*”. Clearly, the idea of a stabilized human having to add, hopefully, some value to a deserted world cannot be the final story. Rather, it corresponds to an extraordinary local, provincial, ethnocentric and highly artificial narrative of what it is to be *in* and *with* the world. It is the freeze-frame of an epoch that has never been extant.

This is why I proposed to shift our focus toward an entirely different phenomenon: that of the ways through which shapes are exchanged. I called it a “metamorphic zone” not only because of the nice geological connotation (very much in the spirit of our geohistorical time), but mainly because it is where the various morphisms, if I can say so, gain their suffixes: *phusi*-morphism (that of our befriended optical pulsar) gives a shape to a phenomenon just as much as the *bio*-morphism of the gene responsible for Huntington chorea, or, for that matter, the *ideo*-morphism of Whitehead’s concepts. They are all agents, agencies, characters, that *do* things and whose content can be accounted only in so far as the set of situations and trials out of which they slowly emerge, may be recounted. It would make absolutely no sense to say that some are inanimate while others are animated. To play the role of the inanimate cause of some other consequences requires just as much animation as that of playing a “human” endowed with intention and will (remember the process of counter-current in the kidney and that of the procession I compared yesterday). To write without animation, without granting intentionality to your agents, to ask them to behave as if they had no value — indeed to write as if you had no style and are not writing at all — is a style all the same. And so is the custom of telling a cause-and-consequence story as if the causes had really been there before the consequences. It is another montage, one that produces interesting effects, but a montage all the same.

However, as long as we remain in narrative, in text, in semiotics, the argument may be plausible but it has no teeth — it remains what folks in the humanities say about the natural world. What I tried tonight is to move one step further and to see whether it could be used

to draw a diplomatic zone where another deontology could apply. A deontology whose rule is: “For natural philosophy everything perceived is in nature. We may not pick and choose.” As we saw, the main difficulty is to build the new scene so that we benefit from objective knowledge without letting the participants believe that what is being objectively known is itself made of *the same stuff* as what allows the entities to be known. For that, it is imperative to localize the very activity of knowledge-making (formerly attributed to a ghostly mind) in space, in institution and also in time — no matter how far it extends. At this point reductionism enters the scene in two opposite versions: a positive one (no agency without its performances) and a negative one (a substance deprived of its real properties). If we manage to keep the second one out of the room — out of the diplomatic encounter — many other modes of insisting about what is in the world may be registered. Then those who are in the room are no longer humans adding value to a valueless world but shape-changers who are able to register the values that are in the world. They no longer have to imagine a ghostly world inside which they are then present — except they themselves are spirited out of it. They can be of this Earth: which is, after all, what we are all aiming at, no?

Then it might be slightly less surprising for scientists and citizens alike to have to deal with entities that insist with intensity and urgency and not just because humans are prone to “project” their fear or their interests upon an indifferent world. The adjective inconvenient in the call to heed “inconvenient truths” might be a true property of the world as well. Or, at least, this possibility has been opened. The scene might be more friendly for Michael Mann and his comrades on the front line. To be a subject encountering an object is no longer a viable position. At least it is no longer the only one that could allow us to decide where we stand.