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Subj.: The Trouble with Physics,
Mariner Book, 2007 (LS, 2007)
here: Some pertinent remarks
Ref.: Classical Dynamics reconstructed

Dear Professor Smolin,

with great interest and pleasure I have read through your extremely informative and sad story of 'the trouble with physics'. Your book had been strongly recommended to me by a physicist, who attended and 'approved' my talk on 'Platon's prisoners and their models', which I gave at a philosophical seminar before Christmas here at the Technical University Berlin (TUB).

INTRODUCTION

The situation you, as a prominent insider; explicitly describe is of course more or less the same in other fields of research, as you mention only cursory on one occasion. As you elaborate in detail the bad luck of all the bright young persons is, that they are brain washed, before they have had the chance to start thinking themselves. And later they hardly have the time to find their way out of the morass of ignorance (Popper), superstition and falsely held instinctive beliefs (Russell), provided they not only vaguely feel, that something is 'wrong', is incoherent, but are aware of the mess as you do.

Personally I was very lucky to have inherited an inquisitive mind and to have had parents, teachers, professors and a director, who gave me any freedom to follow my way and develop my own ideas. After my basic studies I have practised and reflected macroscopic hydrodynamic systems engineering for forty years at the Berlin Model Basin, Versuchsanstalt für Wasserbau und Schiffbau (VWS), and based on that experience I taught professional problem solving as an apl. (adjunct) professor at the institute for naval architecture and ocean engineering (ISM) of TUB. And after my retirement I worked for twelve years intensely on a project, I

had in mind and followed since my school days, *i. e.* for more than sixty years now. So much for the introduction of my person and my background, the details to be found on my website.

OPUS MAGNUM

My recent work resulted in an *opus magnum* titled 'Newton's *Principia* and related principles revisited' (MS, 2009), a rational 'reconstruction of classical dynamics in the spirits of Goethe, [Aristotle], Euler and Einstein'. The three volumes have been published by Books on Demand in 2009, in the meantime also as e-books. Among many other papers and letters details concerning my *opus* are to be found on my website, among them flyers, abstracts, executive summaries, as well as complete sections. Of course I know that everybody wants (and needs?) to be met at his 'place', but I do not know, since when knowledge is considered as a debt to be delivered. 'Success is a prize to be sought, not an obligation to be fulfilled by others.'

To write an *opus magnum* under the title stated may look altogether pretty old-fashioned. But step by step I demonstrate in every detail that this impression is utterly wrong. As an outsider I claim, that if physicists would not be indoctrinated, that classical mechanics is obsolete, but be taught classical mechanics adequately and would understand its implications accordingly, they would do very much better. But nobody is listening, as you vividly describe. I am afraid, that some of the most fundamental curricula are more than 'eight decades behind the science' (LS, 2007/266).

In my view the ways Newtonian and Lagrangean mechanics are being taught since three and two hundred years, respectively, are unacceptable today. But when I offer practitioners, theoreticians, didacticians, philosophers and/or historians of physics, to assist them in updating their instinctive beliefs and in restructuring their fundamental courses, I hardly ever receive an answer. Of course I wonder, whether you will be listening or whether your pertinent remarks were not meant to be 'so' serious.

'UNIMPRESSIVE'

Admittedly 'my work will be technically unimpressive to specialists in the domain' (LS, 2007/343), but I dare to say, that I am not impressed either with technicalities, however fancy they may be. As far as I can follow the literature I agree with Truesdell's verdict (1984/584):

> "A research paper by a physicist is often not more than a chant of beliefs common to his hogan, the members of which rock back and forth in applause of each repetition of the tribal lore."

In my *opus* you find the following remarks: "And as late as 1989 John S. Bell made a remarkable statement concerning the reception [of Bohm's mechanics] (Passon, 2004/14):

> "This theory is equivalent experimentally to ordinary non-relativistic quantum mechanics - and it is rational, it is clear, and it is exact, and it agrees with experiment, and I think it is a scandal that students are not told about it. Why they are not told about it? I have to guess here there are mainly historical reasons, but one of the reasons is surely that this theory takes almost all the *romance* out of quantum mechanics. This scheme is a living counterexample to most of the things that we tell the public on the great lessons of twentieth century science."

The situation is *exactly* the same as in the traditional expositions of classical mechanics and traditional, 'old-fashioned' ship theory, to mention just the two fields the author has ploughed. Classical general relativity as discussed 'takes almost all the *romance* out of the theory of general relativity'.

But people just love superstition, folklore and romance. Don't try to take them away; people will blame you as Paulos noted [in his 'Once upon a number'] (2004/73):

> "Ich wiederhole die meisten dieser Punkte – trotz der Tatsache, dass die Wiederholung von Unsinn viel eher toleriert wird als die seiner Entlarvung, die meistens als Schimpfen und Ereifern aufgefasst wird."

This describes the experience the author personally has made."

GLOBAL MECHANICS

Immediately I have inspected Ashtekar's book, you refer to, and found most of its content far beyond my horizon. But I noticed the importance of Hamilton's principle and the Legendre transformations, as in other fields of theoretical physics. In my 'engineering' exposition on 'Global mechanics' Hamilton's canonical equations are treated as highly degenerate case at the end of the chapter on the Euler-Lagrange theory, on 'Partial energy balances'. In macroscopic mechanics postulating the existence of a potential and of holonomic generalised speed is adequate only in exceptional cases, *e. g.* the motions of heavenly bodies, as already Aristotle 'knew'. The later condition even excludes to treat the kinematics of rigid bodies adequately. For my taste very disturbing is the 'Inclusion of Matter' not before Chapter 9 in a book on gravity.

Apropos *rigid* bodies. As Maxwell clearly stated and as I have shown, fancy *mathematical* constructs may be useful tools for craftsmen, but *by definition* they exclude to understand physics in Goethe's sense. An example of interest is the *mathematical* concept of *rigid* body. *By definition* it excludes understanding gravity, while the *physical* concept of *solid* body provides for a simple model of gravity and *implies*, that the building blocks of 'ponderable matter' (Einstein) must have a structure in accordance with the standard model of nucleons.

This is nothing but finishing 'antique' thinking, no longer 'stopping' at 'atoms', but at the structure of the more or less stable nucleons. Incidentally the 'proof' of the existence of 'atoms', given by Lucretius in his poem '*De rerum natura libri*', was 'exactly' the same as that by Einstein two thousand years later. And it is worth remembering that during the first decades of the twentieth century the structure of the nucleons was still beyond imagination and only one, 'our' galaxy has been known.

PROTO-PHYSICS

I am sorry to say, that I do not agree with your proposal to teach quantum mechanics to freshmen, who usually have only the crudest 'knowledge' (of caricatures) of classical mechanics, forgetting about its implications. Your proposal reminds me of a sad historical episode: teaching children the theory of sets before they learned counting. Presently I am observing how children at age three learn riding bicycles the 'natural' way, while students of physics at age twenty-three are still trained the old-fashioned way, much too late and the wrong way round.

In my *opus* I state already in the cover text: "The relation of the theory of general relativity to classical mechanics is similar to the relation of quantum theory to classical mechanics as claimed by Landau and Lifschitz in 1965:

> "Sie enthält die klassische Mechanik als Grenzfall und bedarf gleichzeitig dieses Grenzfalls zu ihrer eigenen Begründung",

though, according to Laughlin, that claim has never been substantiated (2007/58)."

Sorry, I do not know, how Laughlin substantiated his claim. The claim of Landau and Lifschitz has repeatedly been expressed by other authors. But I claim, that classical mechanics, as found in text books of theoretical physics, cannot possibly serve its foundational purpose.

And I quote another example of falsely held beliefs about classical mechanics: "Although the (meta-)principles are fundamental for all our 'quantitative' theories, classical mechanics in particular, they are figuring most prominently as stepping stone leading to Einstein's theory of general relativity, but maybe not really understood in the sequel, else Synge could not possibly have suggested to 'bury the midwife' (Guilini, 2001/23):

> "The Principle of Equivalence performed the essential office of midwife at the birth of general relativity, but, as Einstein remarked, the infant would never have got beyond its long-clothes had it not been for Minkowski's concept. I suggest that the midwife be now buried with appropriate honours and the facts of absolute space-time faced."

[I do not know of any serious person climbing a roof and forgetting the ladder behind, even stupidly disposing of it.]"

LOCAL MODELS

In a way, my criticism of the state of affairs and my subsequent work start at a much 'lower', more fundamental level than yours. My problem has not been, to solve any 'world problems'. I just wanted to understand, in an intellectually satisfactory way, the foundations of mechanics, *i. e.* what we are doing, when practising classical mechanics. I am not a 'seer', but I try my best, to perform as a professional, who knows why he is doing what, as opposed to a craftsman, called 'banousos' by the Greeks. Lots of what you describe looks like plain fumbling, even according to the crudest engineering standards.

The fact that classical mechanics and other theories, you are referring to as 'background-dependent', are 'local' theories is not disturbing at all. All models are local, as Goethe already knew, when he had Mephisto saying (Faust I, Walpurgisnacht):

> Laß du die große Welt nur sausen,
> wir wollen hier im Stillen hausen.
> Es ist doch lange hergebracht,
> daß in der großen Welt man kleine Welten macht.

Physicists have re-discovered this implication of Platon's parable and fashionably call it 'Abschied von der Weltformel' (Laughlin, 2005), of course without referring to Platon's parable. On various other occasions I had the impression, that Goethe knew more about the theory of science than many physicists today. Another fundamental implication of Platon's parable is, that an adequate model of a system behaviour identified is not unique, but that *equivalent* models can be constructed as convenient for any purpose at hand. And in engineering this is being done routinely in view of the various aspects of any system to be dealt with.

PROMINENT EXAMPLE

The most prominent example of an extremely efficient local theory is Newton's mechanics together with his law of gravity. Alexander Friedmann, the 'inventor' of the expanding universe, has pointed out the reason for this success. In his 'World as Space and Time', which I have extensively studied and referred to in my *opus*, he clearly states (1923/26 ff):

> "Die neue Mechanik [Einstein's theory of general relativity] ist zunächst versucht ohne zusätzliche Hypothesen über den geometrischen Charakter der Welt auszukommen. Sie kann wohl so verfahren, ist dann aber für viele Jahrhunderte zu einer kümmerlichen und fruchtlosen Existenz verurteilt. *Damit die neue Mechanik produktiv wird, ist sie wegen der Beschränktheit unserer experimentellen Mittel ebenso auf Zusatzhypothesen über den geometrischen Charak-*

ter unserer Welt angewiesen, wie es schon die alte Mechanik war." [*Italics: MS.*]

In passing I have noted, that Friedmann's summary of classical mechanics is as unsatisfactory as [al]most [all] others.

CONSEQUENCES

Only after having step by step clarified the fundamentals, it occurred to me, that I might also follow up some consequences of my rational reconstruction of classical mechanics. And as it happened, some ten years ago, just after I had outlined my simple model of the mechanism of gravity, the paper 'das Innenleben der Protonen' of Klanner, director at DESY at Hamburg, showed my conclusions to be in accordance with the standard model of nucleons. In various papers to be found on my website, one under the catching title 'The missing link: classical mechanics', I have shown, that the constant of gravity is due to the low frequency dynamics of the structure ('Innenleben') of the nucleons.

Of course Klanner and the experts at the Albert-Einstein-Institut at Potsdam-Golm, the Max-Planck-Institut für Gravitations-Physik, immediately 'knew', that I was one of those crazy old screwballs and 'consequently' refused to discuss my model. And of course I am wondering with Mara Beller. 'At whom are we [, will we be] laughing?'

Since that time I have tried to get young colleagues at those institutes interested, but as I guessed and you describe in detail, 'sociology' prevents them from working for the Nobel Prize. And they may not all be as bright as you suggest (or your editors?), lacking Goethe's and Einstein's naïve curiosity and imagination, 'Anschauung'. In German we have the perfectly fit term 'begriffsstutzig', for 'dense', for naïve curiosity, usually used with a false undertone.

TRIBAL BELIEFS

Unifications, generalisations and meta-theories are my favourites. In my *opus* I unfold a whole hierarchy of meta-theories. But I wonder, how physicists can possibly unify 'the gravity force' with other forces. According to rational elementary classical mechanics I am promoting, there is no 'gravity field' in 'empty' space around bodies of ponderable matter, but only the mass potential. The most prominent example of force free, inertial motions of freely moving systems of bodies is the motion of the planetary 'mollusc'.

According to my understanding the mass potential may be considered as the aether Einstein postulated in his inaugural lecture and later lectures at Leyden in the 1920s. And as far as I understand the literature the study of the physics of the mass potential is only starting now. Incidentally long before Einstein enjoyed 'den glücklichsten Gedanken seines Lebens' (quotation following Pais) classical general relativity has been subject of amusing party talk at Oxford (Lewis Carroll).

Repeatedly you mention the beliefs of your tribe(s). I cannot retrieve the instance I wanted to refer to, but I like your statement on causality (LS, 2007/241):

> "These days, many of us working on quantum gravity believe that *causality itself is fundamental* - and is thus meaningful even at a level where the notion of space has disappeared.
>
> The most successful approaches to quantum gravity to date combine these three basic ideas: that space is *emergent,* that the more fundamental description is *discrete,* and that this description involves *causality* in a fundamental way."

Hardly to believe; even causality is being re-discovered and re-appreciated by physicists!

EMERGING PHENOMENA

Being a prisoner in a different cave, not only my jargon is different from yours, but my instinctive beliefs (Russell) are quite different. You mention ermerging phenomena only by the way, while in my view they are much more 'fundamental' than you indicate. For me as an engineer the emergent phenomena are the 'real' phenomena, the phenomena of interest. Aristotle was right, the world we live in 'is' continuous, and 'thus' classical mechanics is continuum mechanics. The treatment of continuum mechanics in textbooks on theoretical physics is usually absolutely 'incredible', unacceptable. As an example I have shown, that Schrödinger's equation of non-relativistic quantum mechanics may be derived along strictly classical lines of thinking.

And I just came across 'Treatises on didactics of physics and epistemology' (Jung, 1979), including elaborations on the categories used in quantum mechanics. The conclusion is, that those categories are indeed the same as Aristotle's, thus confirming in general terms my suspicion based on my very general, but admittedly 'singular' result. I will have to follow up this trail.

That there are molecular and nuclear structures of matter underlying continua is 'interesting', but these permit to explain the emergent phenomena mostly only in a qualitative fashion. To derive the emergent phenomena quantitatively is possible only in the simplest cases, if at all, as you also note. As an example I mention the viscosity of Newtonian fluids, to be identified from the results of macroscopic measurements. And further I mention the Navier-Stokes equation. Despite the effort of many mathematicians we still do not know, why Nature prefers turbulent solutions. And if it comes to flows in or around systems, *e. g.* in the oceans, it is evident, that the 'theory of anything' does not, and will definitely never, provide any solutions.

Of course I know and I am impressed by the fact, that presently maybe more than half of the gross national product of developed countries is based on the results of quantum mechanics. I believe that the descriptions in terms of continua and of the underlying structures are referring to the two faces of the same medal.

GLOBAL PRINCIPLES

The phenomenon of Kármán vortex streets and their stability provides an example, pertinent in various respects. From early students days I was convinced that such a fundamental phenomenon cannot possibly depend on the newly developed special 'mathematics', Kármán happened to run into, and on clumsy, tedious computations, but that it must be due to some fundamental global stability criterion. And only decades later, after I had finally understood 'analytical' mechanics, I found the solution, I had been looking for so long, simply by applying Hertz principle of least curvature.

In my *opus* you find the statement: "In order to 'derive' the constant of gravitation according to the rule stated for the global model the low frequency behaviour of the particle systems in the nucleons have to be studied macroscopically. Destroying protons in colliders of ever increasing power can safely be discarded as being the wrong approach, as is killing living creatures in search of their souls. 'Further down' the search for souls on the quantum level has recently been revived."

The other example coming to mind in the context of souls are of course our brains. That the latter consist of networks of billions of neurons embedded in *substrata*, the study of which has only started, does not explain our self-consciousness and self-reflection and 'our foolish behaviour, individually [, as tribes] and *en masse*' (LS, 2007/300). Concerning our tribal heritage

my wife and I recently had most instructive conversations with two young teachers, primary and high school, respectively, and with our son, working in an industrial environment, all highly motivated despite the truly incredible problems they are facing in their respective tribes.

'CONCLUSIONS'

As I cannot possibly repeat all the arguments in favour of my 'Welt-Anschauung', to be found in my *opus*, I disrupt this epistle, which I consider as an open letter, being of interest to many of my friends. I thank you for a most informative reading, supporting much of what I know and/or believe, and I look forward to your response, if any. If there will be none, this letter, after correction of remaining small mistakes, if any, will be moved to my documentary section 'Letters (yet) unanswered!', as others before. But, maybe, you even care to write a critical review of my *opus*, sting the 'balloon' or inflate it further and let it go, for craftspeople to scrutinise and breed the off-springs, I envisage.

And what do you think of my visit to Perimeter Institute, to discuss problems of common interest and to deliver one or the other cheerful talk? I am thinking *e. g.* of 'Platon's prisoners and their models', *i. e.* rational metaphysics, the axiomatic theory of state space models and their implications, of 'Classical theory of general relativity and gravity', *i. e.* the implications of rational classical dynamics and Newton's law of gravitation; and, as an amusing interlude, of 'St Augustine's messengers and the classical theory of perspective relativity', *i. e.* a model of Einstein's theory of special relativity.

For such talks I usually update and customise the presentations to be found on my website and which give only a vague idea of my performance in person. I have of course seen the now popular videos of lectures on various websites, which I find not really convincing, but maybe I am too old to adapt to this format. If you are not interested in my talks, one or the other of your colleagues may be interested, to let his students see the shadows, another prisoner observes at the wall of his cave, and listen to that prisoner, trying to explain, what he is seeing.

Hoping that you appreciate my endeavour, to conform to good manners as far as possible, I remain with kind regards and my best wishes for the new year yours,

Michael Schmiechen.