

-----Original message-----
reformatted, with minor
corrections and additions

From: Michael Schmiechen
Sent: Monday, September 22, 2014 3:21 PM
To: Giulio Gennaro
Cc: Klaus Wagner ; Bettar Moctar ; Clemens Strasser

Subject: Ship theory, changes of paradigms

Dear Giulio Gennaro,

this is another of my long explanatory letters, triggered by unqualified judgements of my work on trials and monitoring by a member the Specialists Committee on the Performance of Ships in Service, by the question of a young colleague, wondering what the purpose of my intense work on the rational theory of propulsion might be, and last, but not least, by a remark of Dr. Wagner, having forgotten my conception of propulsors as pumps and its potential for designing energy (!) wake adapted propulsors, treating all interactions implicitly.

INTRODUCTION

First of all I am sorry and apologise for my stupid decision to send my parcel at book-rate, trying to save some cents, while our trip to Copenhagen and printing the two volumes of my 'Festschrift' and the leaflet, intended to draw wide attention to my recent work documented in the two volumes, have cost me a small fortune.

Dr. Wagner has already carefully scrutinized my first steps to 'streamline' the evaluation of my quasi-steady 'model'-test including the identification of the current from the quasi-stationary states 'passed'. I shall digest his observations as soon as possible, hopefully at the beginning of next month, after finishing my long overdue tax declaration, definitely before I start to evaluate the data of your recent test.

In the meantime I am intensely working on a Written Contribution to the Group Discussion on the Future of ITTC. Before setting out for a vacation Dr. Wagner has scrutinised a preliminary version and his remarks and suggestions have triggered a torrent of pertinent ideas. Although I have published most of them repeatedly on various occasions for any taste, they have hardly ever been acknowledged appropriately.

This letter to you, as an earlier one to Prof. Bettar el Moctar, has the very pragmatic purpose to re-collect and to organise my ideas. The most important, the basic idea concerns the implications of my holistic approach and its demonstrated and its potential impact on future research. Incidentally the term 'holistic' has already long ago been used for my work on hull-propeller interaction by my fan and 'follower' Luigi Iannone, formerly at INSEAN Rome.

HOLISTIC APPROACH

The term 'holistic' perfectly and concisely hits the 'paradigm' I am promoting since I wrote my doctoral thesis in 1964 on the motions of bodies in fluids, 're-inventing' the explicit Euler-Lagrange (matrix) equation, my power tool and workhorse until today. Claiming a (change of) paradigm, quite 'fashionable' after the publication of 'The Structure of Scientific Revolutions' by Thomas Kuhn, sounds of course pretty arrogant and instantly causes the 'resistance', I experience and understand only too well.

But I do not understand the lack of curiosity, openly admitted even by young colleagues at the recent ITTC, falsely claiming lack of time as reason for not reading, forget about trying different view points and studying alternative approaches.

Of course I am changing paradigms and prejudices, alias 'principles', of naval architects. 'But' I am doing it by embedding ship theory into classical mechanics and its implications - *nota bene* not only concerning ship theory -, which I finally understood in full depth during my rational reconstruction of classical dynamics in 2009.

Even before that I have always consistently applied the Lagrangean aggregate approach of energy balances in terms of partial powers, alias 'generalised forces', instead of the Newtonian approach of momentum balances in terms of 'forces', i. e. momentum flows and productions. And I have demonstrated the power of this approach by solving problems definitely impossible (!) to be solved via the Newtonian approach.

More than three hundred years after the publication of Newton's 'Principia ...' and two hundred years after the publication of Lagrange's 'Mécanique analytique', written at Berlin (!), the implications of classical dynamics are not yet understood, not only by naval architects, but even by physicists, claiming that after Einstein's work it is 'wrong' anyway.

THE REASON

The starting point of my work has been the fact that components of hydromechanical systems, in the simplest case hulls and propellers of ships, 'forgetting' about their rudders, are not 'Lego bricks' that can 'simply' be taken apart. But to my surprise none (!) of the Members of the Propulsion Committee of the 27th ITTC 2014 even tried to answer my question concerning the 'meaning' of open water tests with wake adapted propulsors, provided they can be performed in a meaningful way, at least on model scale.

The only (!) consequence to be drawn and which I consequently (!) have drawn, is to use the holistic approach. And this has already been proposed for model propulsion tests by Fritz Horn in the early 1930s and tested by Troost at Wageningen and by Yamagata at Tokyo, the results having been presented and discussed at the 4th ITTC at Berlin 1937. As I have repeatedly stated, these tests suffered 'only' from the lack of adequate conceptual, experimental and computational tools, further developments being disrupted by the Second World War.

Horn's 'Copernican turn' has been to look no longer at the energetically neutral hydrodynamical short circuit between propeller and hull, but to study

'equivalent' propellers, *i. e.* of the same mass and energy flows as the original propellers, in the energy wakes, *i. e.* 'far behind', 'outside' the displacement wakes of the hulls.

As soon as the limitations mentioned no longer existed, I have started to develop the holistic approach in detail. And I have continuously reported on the results of my studies and invited colleagues to join me in my effort. To my knowledge quasi-steady testing has been developed by Jan Holtrop and is further being developed at Wageningen. Michiel Verhulst and Patrick Hoojmans are the first to have publicly *expressis verbis* acknowledged my continuing pioneering work.

PROPULSOR DESIGN

One argument raised very early at one of my annual lectures at the Colloquium of the Institut für Schiffbau at Hamburg was, that the holistic approach does not permit to design propellers, propulsors in general. And this argument has now been repeated by Klaus Wagner. As a matter of fact I returned to Hamburg the next year with a fundamental solution, which has become the starting point of my intense, continued work on ducted propulsors, documented in detail and in an extensive bibliography in the Section 'On ducted propulsors' on my website.

The basic idea, another 'Copernican turn', has been to conceive propulsors not as thrusters overcoming the resistance of hulls, but as pumps, feeding energy into the fluid, treating thrust as a nasty by-product and all (!) interactions implicitly as in pump design. This way I have designed and successfully tested an energy wake adapted propulsor without even mentioning thrust and thrust deduction.

In any case designing ducted propellers in open water, as is still the 'practice' in research, is definitely a dead end and a waste of resources. Admittedly I have not (yet) tackled the design of 'open' propellers, but with the CFD tools available today that problem will definitely be solved soon, maybe not at towing tanks, but at one of the many institutes with more powerful tools and concerned with holistic flow computations.

OTHER ACCOUNTS

The present account of the reasons and the background of my work is an in-depth continuation of earlier accounts of interest in the introductory sections of the two volumes of my 'Festschrift. In the first volume it is the paper 'Future Ship Powering Trials and Monitoring Now!' of 44 pages, providing a complete overview of all branches followed so far, some already even developed to maturity.

In the second volume it is an executive summary 'On the objective identification of the propulsive performance of ships in service' of hardly 3 pages, providing the reasons for the fundamental conclusions I have drawn and in future, *nolens volens*, to be drawn by naval architects.

PRAGMATISM

Before I close and continue to draft my ideas on the 'Future of the ITTC', it is necessary to repeat and to elaborate on my earlier remarks concerning the

implications of the term 'objective'. The purposes of the models are essentially 'objective' predictions and assessments of the performances of marine systems. Anything else is irresponsible waste of resources. Hence my Commandment of Objectivity in the spirit of Lagrange's aggregate approach:

"Thou shalt not introduce more parameters in vain than you can identify reliably without any prior data [in terms of the model agreed upon]."

The essential implication is, that scientific knowledge is not 'true', but 'only' useful, – hence the motto of the second volume –, describing the data at hand in terms of models agreed upon. In accordance with the current usage the term 'objective' implies 'independent of the observer', even more adequately being called 'inter-subjective' (Küppers, G.: Chaos und Ordnung. Stuttgart: Reclam, 1996. Nr. 9434, p. 148).

This is not a new insight, but it has already been stated *clare et distincte* in the introduction 'Ad lectorem' by Osiander to only (!) the first edition of 'De revolutionibus ...' by Nicolaus Copernicus 1543. All models serving a purpose at hand are equivalent and the selection of one or the other, maybe the simplest, most convenient for wider use, is a matter of agreement, of standardisation, *i. e.* of convention, and not of physics, not of hydromechanics.

At the time of Osiander there has of course been a strong opposition against his naked pragmatism and his introduction to the work of Copernicus vanished as unnoticed as it appeared in the first edition. But the opposition continues until present days and delays progress in theory and practice.

SUMMARY

In summarising I state, that the purpose of my work is to understand the essence of the problems at hand and thus provide solidly based approaches for efficient innovative solutions. In a wider context than mine, e. g. ship design, the holistic approach promoted is too narrow and more general models need to be adopted, e. g. the holarchic model of Arthur Koestler, the conception of a hierarchy of holistic models, of 'holons'.

As usual I shall publish this letter of wider interest on my website and invite qualified discussions, to be published duly acknowledged.

With kind regards yours,
Michael Schmiechen.