ing directional in the sense of given priority to kinetic energy at the expense of any form of potential energy. Time's arrow points in the direction of kinetic chaos.

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Rational Thermodynamics and Mechanics

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In the short communication "Brønstedian Energetics and the Basic Kinetic Process"[1] Torben Knudsen criticises my choice of $v^2/2$ and M as the potential and the quantity in the basic kinetic process in mechanics.[2] He argues that it would be better to choose momentum **p** as the conserved quantity and velocity as the conjugated potential. I perfectly agree with this objection, since I had already some qualms about it when I wrote that **p** and **v** is a more convenient bipartition of the kinetic energy than the pair chosen in Table 1, Ref. 2. This was written in connection with eqn. (20) in the paper No. III in the series "Towards a Rational Thermodynamics".[3]

It is not true – as states Knudsen – that conservation in itself is a fundamental property of a Brønsted quantity. Moles are not conserved in chemical reactions, interfacial area is not conserved in emulsification process and entropy not in irreversible processes, just to take some examples. Also, the heavy mass is just as conserved as momentum in classical mechanics. However, **p** and **v** is a better choice, since the analogy between momentum transport in velocity gradients in viscous processes, charge transport in electric fields, entropy transport in temperature gradients and so on is much more clearly put forward, as well as the differences: momentum transport is a tensorial process in contrast to the "normal" vectorial transport processes or scalar chemical processes. With respect to the transition to relativistic mechanics, I would like to point out the pages 95 to 110 in my Ph. D. dissertation[4] where I have sketched the outlines of a general thermodynamic systems theory. Similar attempts were at the same time and independently made by Oster, Perelson and Katchalsky[5] and by Karin Beyer.[6] Especially, one observes in Table 2, p. 98 in Ref. 4, that the basic difference between classical mechanics and relativistic mechanics is that the constitutive relation between momentum and velocity is nonlinear in the latter, and therefore there is a difference between kinetic energy and coenergy in relativistic mechanics, but not in classical mechanics. Whenever a difference, the coenergy turns out to be the fundamental energy-function to be used *e.g.*, in Hamilton's variational principle, see also Lanczos' monography.[7]

Finally, I do not quite agree with the statement of Knudsen, that any coupling in which the basic kinetic process is taking part stands in contrast to reversible couplings between other Brønstedian basic processes, since it can never be brought to any static equilibrium. Purely mechanical systems with no dissipative elements are just examples of static equilibrium between potential forces and inertial forces, as expressed in the principle of d'Alembert.[7] The earth revolving around the sun is a system in perfect thermodynamic equilibrium (tidal effects neglected): reversible coupling between the gravitational basic process and the kinetic basic process is taking place and the system is neutrally stable (in the Liapounov sense) to external disturbances. The fact that time explicitly enters the kinetic potential (velocity) should not obscure this fundamental analogy to other reversible couplings between Brønsted's basic processes.

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