# The *Karlsruhe Physics Course (KPK)*

Information and Request
from the German Physical Society (DPG)
to Members of EPS Council

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# KPK : Historical Background

- Concept for physics teaching at schools driven by didactic principles :
    - Analogies between different areas of physics
    - Differences between *intensive quantities* drive currents of *substance like quantitites*
    - Examples : Momentum currents, entropy currents, charge currents
- Developed by F. Herrmann et al. at the former *Institute for Didactics of Physics* at Karlsruhe University (now KIT) since the late 1970s
- Substantial political work to instantiate the KPK at schools during the 1980s
- 1988 – 1992 : Government approved trial phase at approx. 20 schools in the German State of Baden-Württemberg (BW)
- 2004 : KPK textbooks approved in BW for official school use
- Course spreads into other German States and other countries (e.g. China), translations in many languages available
- 2012: First secondary school exams (Abitur) based on KPK teaching in BW
- Reports about discrimination of young physics teachers when using the traditional physics approach (non-availability of traditional teaching support materials)
- Increasing number of complaints about KPK expressed from involved teachers to university professors (style of introduction and content)

Details about KPK : www.physikdidaktik.uni-karlsruhe.de

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Publication of an expert opinion based on a study commissioned by DPG and performed by a group of 13 experimental / theoretical physicists from German universities and schools (Bartelmann, Bühler, Großmann, Herzog, Hüfner, Lehn, Löhken, Meier, Meschede, Reineker, Tolan, Wambach, Weber).

Expert opinion (in German) available on DPG website, sent to German physics departments and ministries of education
http://www.dpg-physik.de/veroeffentlichung/stellungnahmen_gutachter/Stellungnahme_KPK.pdf

Conclusion from expert opion (translated)

*The KPK does neither qualify as a basis for teaching nor as a reference for education and teaching guidelines in physics. We recommend that the German Physical Society (DPG) ensures with particular emphasis that the KPK will not be used in Physics teaching.*

# Some major Problems of the KPK as identified in the DPG Study

- Incorrect transfer of the momentum flow concept from field theory to classical mechanics
- Renunciation of Newtons Laws (concept of inertia, inertial frames of reference)
- Equalisation of entropy and heat
- Incorrect use of entropy, inability to explain simple processes like the expansion of a gas at constant T or the mixing of substances
- Introduction of magnetic charges in analogy to electric charges
- Introduction of the vacuum as a carrier for electromagnetic waves
- Ad-hoc introduction of new physical units outside approved SI standards
  - Hu ygens (Hy) for Momentum Current
  - Carnot (Ct) for Entropy
  - Weber (Wb) for „Magnetic Charge“ (already in use for Magnetic Flux $m^2 \cdot kg \cdot s^{-2} \cdot A^{-1}$)

*ESSENTIAL : The DPG study does not question the fundamentally important right of all physicists to develop our science based on new insights. It rather points to obvious mistakes and inconsistencies in the KPK. It underlines the essential fact, that Physics cannot be altered for the sake of didactics.*

*The term „Altlast“ came into being in the early 1990s to describe a phenomenon that showed up after the breakdown of the communist regime in East Germany. The rotten and hazardous industrial plants and other infrastructure remnants that are not only useless, but also necessitate large investments for their rehabilitation, are called „Altlasten“.*

*In physics there are such infrastructure remnants from the historical development of the subject. We hope that by identifying them, we can begin to make the investment towards fixing them. We have chosen the title „Historical Burdens of Physics“: Like the hazardous sites of East Germany, these concepts once served a purpose, but now they must be cleaned up before further gains can be made.*

F. Herrmann, Proceedings of the GIREP Conference on Modeling in Physics and Physics Education, August 20 – 25, 2006, Amsterdam, Netherlands

Petition to EPS Council Members

*Please contact me or the DPG office if you notice that KPK based teaching is used at your schools or universities. DPG will supply you with the necessary arguments and materials to counteract this development which is damaging to the reputation of our field and to the necessary improvement of Physics teaching at all school levels*