:: Theoretical Physics, and: Management of Scientific Information

contributions (1956-2020) in conjunction with Eberhard R. Hilf and his collaborators

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Abstract

As a complement to reviews of recent publications worldwide we take a dive into the archives back in time to unrevel topical research by a theoretical physics group with the author at the University Frankfurt a M. 1960-1967), University Würzburg (1967-1971), the Technical University Darmstadt (1972-1985) and the University Oldenburg (1985-2011), Germany. It is the hope that present day researchers will make use of the document links given and that their present research may be inspired and supported.
Topically we mention work in research fields as named in the table of contents. The reader should from there directly jump to his specific field of interest

This text is to be read with care, because of its hidden incompleteness, personal bias, and preference; thus time witnesses are invited to correct and supplement by mailing me relevant information to hilf@isn-oldenburg.de.

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Perspective

Early research is for audacious researchers, but thus with few colleagues, finding relevant basic results even if they are only modestly gifted and educated, but before the worldwide highly competetive and extremely gifted and

trained community of physicists enter the field. For a small research group at a remote University but with the ambition to do prime research work we felt it wise to look for new and relevant topics. The early bird gets the best food but later will get out of sight by the many who come later.
In contrast, the documents on management of scientific documents are not intended as prime research but to propell the use of new technical tools for the sake of free accessability of scientific documents.

This listing of papers is to lead you to the papers mentioned for you to read, not to summarize their content. By this the credit goes to the authors of the respective paper. Thus it makes sense, that you just read here the section of the topic you are interested in.

Generally speaking, in an analysis of the duties and tasks of Natiomal Research Libraries one recommendation is, not just to archive papers, but keep them readable and available, searchable, understandable in the present context [SHbr].

If a given link does not work, you may refer to google scholar.

Chapter 1

Theoretical Physics

1.1 Nuclear Astrophysics

In 1933[1] the astrophysicists W. Baade and F. Zwicky, then at University of Göttingen, proposed that a neutron star should be theoretically possible. They even scanned the sky and found exactly one star, which was different from all others in that it had no photonic line spectrum. But since there was no idea, how such an object could be formed, the paper wacs forgotten. But in 1967 when I started my first postdoc engagement, with Prof. Rolf Ebert[2] the astrophysicist, me as by then a nuclear physics theorist, he knew about the paper of Baade and Zwicky, we both were looking for a serious joint research topic, him having been a scholar at Göttingen. Half a year later, the first pulsar was discovered, - the very one, Baade and Zwicky had proposed, the Crab Nebula central star.
Thus we [3] focused on the questions:

- what are the properties of neutron star matter,
- what is the structure, composition and equation of state of the neutron star crust.

[1] The discovery process is revealed in Adam S. Burrows, Baade and Zwicky: Supernovae, neutron stars, and cosmic rays, PNAS February 3, 2015 112 (5) 1241-1242 doi

[2] Rolf Ebert, Wikipedia,

[3] we use the word 'we' not as pluralis majestatis 'we, the king of nothing, declare' but to emphasize it is joint work of the group and the credit should go to the authors of the respective papers mentioned.

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1.2 Quark Deconfinement

In 1979, when at a stay at the University of Washington, Seattle, Larry McLaren[4] and Larry Wilets dragged me into the field of the classical field description of Yang-Mills for a single quark. Back in Darmstadt Michael Wendel analyzed the three quarks of a nucleon, embedded in a nucleus, thus modelling the nucleon-nucleon force as a tunneling of quarks between nucleons.[**1985-1**][**1985-4**] analyzed the three quarks of a nucleon, embedded in a nucleus, thus modelling the nucleon-nucleon force as a tunneling of quarks between nucleons.[**1985-1**][**1985-4**],, [Kle+86] which we presented at the Proceedings of the AMCO VII, 7th International Conference on Atomic Masses and fundamental constants. [SHc95]

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[4] Larry McLaren, University of Washington, Seattle, USA https://indico.cern.ch/event/820556/page/17060-about-larry-d-mclerran

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1.3 Mathematics

The tiny slice of Mathematics treated was in 1963 the long standing question in number theory:
There is no number above 130 with the property that multiplied by $(8n + 4) * 4 * *m$ *with non-zero integern*, m *that can be presented as as a sum of three non-zero squares. The complete series of such numbers is finite, just* $1, 2, 5, 10, 13, 25, 37, 58, 85, 130$.

In 1960-63, with the help of the last electric-tube computer engine Zuse III at Mainz we could show by testing each number that there is no such number within the reach of the time. H.-P. Baltes in the 1970ties enlarged the area considerable. But a mathematical proof of the lemma was only given in about 2010 by a Mathematician from University of Bonn (please someone to hand me a link) with the tools of modern mathematics. This lemma seems somewhat off-topic for physics, however it has simple and well asked-for consequences: For an empty cube with reflecting walls there are eigen-values for allowed oscillation of fields (acoustic, light, etc.). The average asymptotic level density enters many global properties of the radiation fields, and this is not 1 but 6/5 asymptotically. H.-P. Baltes with his collaborators have explored the consequences for cavities with electromagnetic fields.

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1.4 Theoretical Physics of atomic clusters

The physics of Atomic clusters, that are clusters of a finite small number of atoms is interesting:

- *the finiteness in space adds one (or more) thermostatic variables,*
- *the statistical fluctuations become observable as time oscillations in real space,*
- *phase transitions are described by poles in the complex (T,t) space of the equation of state, approaching the real T-axis for larger N.*

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1.6 Physics of PDMS Plasma Desorption Mass Spectrometry

R.D. Macfarlane (Texas A+M University) and his guests from Germany, K. Wien (TH Darmstadt) and H. Jungclas were bombarding targets with fission fragments of $Cf_{[}252]$ when they saw by chance large organic molecules emerging intact the surface. Thus a new research field was born. Up to then bombarding surfaces with particle beams or lasers heated the spot and praticles from the target evaporated from the surface – thermal desorption. But

here, with the excessive high energy of the fission fragments, enough energy in excessively small time was deposited locally in the impact channel – the entropic desorption was born.
With this, large organic molecules could be desorbed intact such as e.g. Insulin etc. and their mass measured accurately by time-of-flight.
At Oldenburg, we aquired a fund from the BMBF and Wilfried Tuszynski, with in collaboration with karl Wien (TH Darmstadt) built a PDMS machine (the method has the misleading name ' Plasma Desorption Mass Spectrometry).

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Chapter 2

Management of Scientific Information

2.1 Theses online and open access

In 1996 M. Gröetschel [1] *identified the subsection of academic theses and dissertations as an ideal field to persue the transition of its archives towards Open Access without being blocked by the large commercial publishers.*

Thus the IuK Initiative[2], [3] *set up a task force which successfully applied for funding by the German Research Foundation: dissertationen online, with the partners*

Rich activities evolved, on registration process of online theses, Open access posting by local University Libraries using a proposed national standard, archiving by the National Library, tools for enriching scientific information such as how to make use of the Metalanguages PhysML and MathML in HTML documents, reaching an internationally approved metadata set for theses and dissertations, etc.

[1] M.Grötschel, ORCID:0000-0001-8759-6377

[2] IuK Initiative Information and Communication of the Learned Scientific Societies in Germany

[3] Information und Kommunikation 2005: Ein Lagebericht und einige Zukunftsperspektiven; Hans-Werner Bierhoff, Joachim Funke, Ulf-Dietrich Reips, Erich Weichselgartner; Psychologische Rundschau (2005), 56, pp. 212-219. https://doi.org/10.1026/0033-3042.56.3.212. 2005 Hogrefe Verlag Göttingen

In Oldenburg, Kerstin Zimmermann[4] *was in charge of setting up and operating an online registry dissonline, which listed the links to the University Library Dissertation Repositories.*
The real impact of all these activities can be inferred from the number of online open access dissertations in Germany by the National Library, with its steep rise[5].

Together with the group of Joachim Schöpfel[6] *Thomas Severiens as the leading scientist of ISN found that the ratio of freely accessible open access dissertations is about 50 per cent of all in both countries, but that the other half has not been rgistered by the authors online in the local University Library while in France they do, but with embargo of various types.*

The lesson is, that dissertations are an important and unique sector of scientific information, nut to get them available open access it needs active support, not passively waiting that the author will find the way to the library repository with its rules.

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[4]Kerstin Zimmermann; https://www.physik.org/kerstin/publications.html

[5]Dissonline and Online Dissertations; German National Library; https://www.dnb.de/dissonline

[6]Joachim Schöpfel, University Lille, Francec; https://orcid.org/0000-0002-4000-807X

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[Hil17] Eberhard R. Hilf. "Was wissen Wissenschaftlerinnen und Wissenschaftler über ihre Urheberrechte, wie handeln sie, und was wünschen sie? Umfrage zum Urheberrechtsgesetz an wissenschaftlichen Hochschulen". In: *Aktionsbündnis Urheberrecht für Bildung und Wissenschaft; Server: Veröffentlichungen* (2017). http://www.urheberrechtsbuendnis.de/docs/urhg-umfrage-Teil-1-3-public.pdf.

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Chapter 3

Alia

3.1 Marine research, offshore sailing

some certificates,prizes

- *Sportseeschiffer, 27.4.1961, Hamburg*
- *Licence C (offshore worldwide) of German Sailing Association, 12.10.1961*
- *licence as examiner (Prüferlaubnis) for all licences A-C; Nr. DSV/FSA854/70 26.2.1971*
- *UKW licence 13.4.1973, radio telephne licence*
- *radio operator licence SRC 2013*
- *Prices for cruising of the Cruising Ass. (Kreuzerabteilung): Gold 1967 voyage to Norway; silver: 1973 Norway (10.50 steel yacht)*
- *some cruise racing on the ems Estuary, e.g. Gandersum-Borkum (first on calc. time),*

some physics and tests

- *1956 Gebrauchsmusterschutz (priority registration) for a Log/speedometer for sailing yachts*
- *1972 Test of a Longwave Direction Finder: Northern Atlantic*

- *1973 test of a UKW receiver on board a sailing yacht (North Sea, Skagerak)*
- *1992 sampling biological molecules at the sea surface for Dr. W. Tuszynski, Univ. Oldenburg (Zimon Sand, NL)*

3.1.1 history

1955:Starting sailing on centerboard boats (Pirat, Weserjolle, Vogeljolle) on the tidal Elbe river; with singlehanded trips Hamburg-Hemmoor/Oste in a steel-Pirat, to isle of Amrum (in a centerboard dinghy cruiser, with Klaus Hesse in his steel Pirat (almost 17ft) from isle of Norderney to Hamburg; oand with a 20ft keel boat to Helgoland, Norderney from Hamburg.

Commanding all kinds of sailing yachts from 27 to 45 ft, and a trip in Octobre to Norway with the12mR /75ft wooden ANITA (without a motor). Chartered boats: 49ft in the Mediterranian, 34-52ft in the Baltic Sea, 27ft (Seattle, Puget Sound to the San Juan Islands); Doublehanded with Yvon LeBeyec (owner) from Marseille to Korsika island, as navigator on a 35ft Steel yacht from Newport, R.I., USA to Cherbourgh, France.

In 1976 we bought with the friends Justus Diller and Klaus Rönnau the 32ft steel sailing yacht Isern Hinnerk and did family cruises to isle of Wight, Rye, Canche estuary to the wadden sea up to Esbjerg (DK), Norway, baltic sea to Rügen island, sold in 2022.

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[Hil+92] E. R. Hilf et al. "Sailing Research Vessel for the Wadden Sea: A Consequent Way of Environmental Data Acquisition". In: *Theory Group III, Department of Physics, University Oldenburg, Germany* UO-Phys.Theo.-21-1992 (1992). https://www.researchgate.net/publication/234008522_Sailing_Research_Vessel_for_the_Wadden_Sea_A_Consequent_Way_of_Environmental_Data_Acquisition.

[BH95] H. Barth and E. R. Hilf. "Solitary wave calculations for erosion strength". In: *Helgoländer Meeresuntersuchungen* 49 (Mar. 1995), pp. 805–810. DOI: 10.1007/BF02368403. https://rdcu.be/cL9wU.

[HH] Eberhard Hilf and Sigrid Hilf. *Segeln im Wattenmeer - Anregungen zur Planung eigener Reisen ins Watt*. Vortrag Vereinsabend im ROYC Rostocker Yacht Club. https://doi.org/10.5281/zenodo.5977816.

[Fre+12] Asmus Freytag et al. *Proposal to Encode Nautical Chart Symbols used in Running Text*. 2012. http://corp.unicode.org/~asmus/ChartSymbolsInRunningText/.

3.2 organizing international Conferences and workshops

Hirschegg Wangerooge I Spiekeroog Jena Leer oldenburg 1-4 fuerstenlager Hirschegg astrophys.

3.3 Academic Teaching

[E.R75b] St.Ludwig E.R.Hilf. *Theoretische Physik II für Lehramtskandidaten: Elektromagnetismus*. Gelbe Reihe: Institute for Nuclear Physics, TH Darmstadt, Germany. 2te Auflage. 1975.

[E.R75a] E.R.Hilf. *Physik und Kommunikation*. gelbe Reihe: Institut für Kernphysik, TH Darmstadt, Germany. 1975.

[Hil77] Eberhard R. Hilf, ed. *Das Physikstudium an der TH Darmstadt*. NDB: http://d-nb.info/970894309 Signatur: DKs 85/4363i; Bereitstellung in Frankfurt. Fachbereich Physik, Technische Hochschule Damstadt, 1977, p. 43. http://d-nb.info/970894309.

[E.R77] E.R.Hilf, Fachschaft Physik, Arbeitsgruppe Orientierungswoche, Hochschuldidaktisches Zentrum. *Orientierungswoche Physik für Studienanfänger*. gelbe Reihe des Instituts für Kernphysik, TH Darmstadt, Germany. Bericht. 1977.

[R.H04] Eberhard R.Hilf. *Methods and Theory of Clustering -1*. Seminar for InfEng Information Engineering Students at Osnabrueck. 2004. http://www.staff.uni-oldenburg.de/eberhard.hilf/vortraege/osnabrueck04/clustering-1.html.

3.4 talks

for talks on conferences, workshops etc. see for Physics, and for Management for scientific information.

3.5 memberships

- *DINI Deutsche Initiative für Netzwerk–Information, member of Board and scientific advisory Board.*
- *EPS (European Physical Society) member of Action Committee for Publication and Scientific Communication.*
- *FIZ (Fachinformtionszentrum Karlsuhe): scientific Advisory Board*
- *IWI (Institut für Wissenschaftliche Information) Sci.Board*
- *CCSD 8Centre pour la Communication Scientifique Directe) of the CNRS, France*
- *IuK Initiative für Information und Kommunikation der wissenschaftlichen Fachgesellschaften in Deutschland : Speaker 1998-1999*
- *BMBF (German Ministery for Education and Research) member of Steering Committee GIC (-1999)*

[Hil97a] Eberhard R. Hilf, ed. *Der Fachbereich Physik stellt sich vor.* 1997.

[Hil97b] Eberhard R. Hilf. "Ein Leuchtturm an der trügerischen Küste der Physiker". In: *Written thoughts and congratulations dedicated to K.H. Bennemann.* Ed. by Freie Universität Berlin Institut für Theoretische Physik. 1997.

3.6 some public activities

[Hil97a] Eberhard R. Hilf, ed. *Der Fachbereich Physik stellt sich vor.* 1997.

[Hil97b] Eberhard R. Hilf. “Ein Leuchtturm an der trügerischen Küste der Physiker”. In: *Written thoughts and congratulations dedicated to K.H. Bennemann*. Ed. by Freie Universität Berlin Institut für Theoretische Physik. 1997.