Alfred Saupe – 50 Years of Research

What we can and what we cannot learn from bibliometry

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Max Planck Institute for Polymer Research, Mainz, Germany

37th German Liquid Crystal Workshop, Stuttgart

Alfred Saupe Commemoration Session

Introduction

- Scientific achievements of A. Saupe (*40 Years of Research*)

  Festschrift on the occasion of Alfred Saupe's 70^{th} birthday, *Dynamics and Defects in Liquid Crystals*, edited by P.E. Cladis and P. Palffy-Muhoray (Gordon and Breach 1998); and in *Mol.Cryst.Liq.Cryst.* **292**, 1 (1997)

- Bibliometry for A. Saupe

Number of Publications

Web of Science: A. Saupe = 162 (or 151 until 1997) dead wrong

true numbers: 134 (or 127 until 1997 according to the Festschrift)

double counting, abstracts, wrong A's (Adrian, Anne)
but also missing papers (e.g. *Z.Phys.Chem.* of the late 50s)

- do not trust the numbers
- numbers are not all
- much more scientific work than publications
- publication only after very comprehensive studies

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Hirsch Index

Web of Science (corrected): $H_{A.Saupe} = 35$

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Citations (general)

- impressive number of total citations:
  ca. 8754 in total
- but very unevenly distributed
- very high numbers for few papers:
  12.5% of the papers draw ca. 6592 (or 75%) citations
- many papers with almost no citations:
  30% have less than 10 citations and 15% less than 2
- blockbusters, but also work outside the main stream fashion
- closer look necessary

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Citations (Maier-Saupe theory) I

- The 3 original papers setting up the Maier-Saupe theory

  W. Maier and A. Saupe, *Z. Naturforsch.* **A13**, 564 (1958), **A14**, 882 (1959), and **A15**, 287 (1960)

  have been cited 809, 1557, and 1346 times, respectively (status 2/2009)

- citations very high on long time period
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  (1959): 1983, 2001, 1976, 1995, 2000
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Citations (Maier-Saupe theory) II

- still cited on a high level

citations	2000	2001	2002	2003	2004	2005	2006	2007	2008
(1958)	23	28	21	15	12	25	17	20	10
(1959)	47	59	36	40	44	35	34	37	26
(1960)	32	47	24	20	22	16	28	35	20

on average 28 citations per paper per year in the 21st century, yet.

- recognition was delayed

citations	1960	1961	1962	1963	1964	1965	1966	1967	1968
(1958)	0	0	0	2	0	0	1	1	3
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not only because the papers were in German, but also ahead of time

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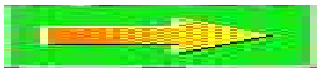
Maier-Saupe Theory and how it evolved

- absorption of polarized UV light, isotropic vs. nematic (diploma thesis)
  $\longrightarrow$ no special "nematic" interaction[1]
- spectra of benzene π-electrons in PAA
  $\longrightarrow$ long-ranged *induced* dipole interaction[2]
- larger $\Delta\epsilon$ leads to larger nematic existence range
  $\longrightarrow$ odd-even effect in alcyl chains



self-consistent mean field treatment (á la Weiss' ferromagnetism); angle-dependent mean field potential calculated in 2nd order perturbation theory;
very successful Maier-Saupe theory, $S(T)$, $\Delta\rho$, pretransitional effects, heat of transition, specific heat, compressibility, etc.

[1] W. Maier, A. Saupe, *Z.Phys.Chem.* **6** (1956) 327
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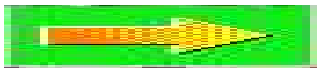

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NMR Measurements

- NMR for nematics, theory and experiment[3]
- NMR of other organic molecules embedded in nematics:
  - sharp spectra due to motional narrowing
  - very ordered environment allows for more information
- together with other spectral methods (UV, IR) intermolecular forces, quadrupolar interaction, electronic structure, proton distances, anisotropic chemical shifts were obtained

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Further Highlights

- biaxial lyotropic nematics[4] and their Leslie-Ericksen dynamics[5]
- smectic C phase by Schlieren textures
- chiral smectic C phase as conic-helically twisted structure
- director relaxation rather than linear waves
- blue phase as cubic superstructure of defect lines
- started polar smectic mesomorphism (A_2 phase)
- nematic gradient energy (calculations and measurements, K_{13})
- defects and textures (Schlieren, fan, focal conics, dislocations)
- instabilities (EHC, smectic undulations)
- amphiphilic and micellar lyotropic liquid crystals
- optics-related research (selective reflection, electro-optical, electro-clinic, electro-mechanical)

[4] L.J. Yu, A. Saupe, *Phys.Rev.Lett.* **45** (1980) 1000
[5] A. Saupe, *J.Chem.Phys.* **75** (1981) 5118

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[6] A. Saupe, *Mol.Cryst.Liq.Cryst.* **7** (1969) 59

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[7] J. Nehring, A. Saupe, *J.Chem.Phys.* **54** (1971) 337; **56** (1972) 5527

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[8] J. Nehring, A. Saupe, *Faraday Transact.II* **68** (1972) 1
[9] A. Saupe, *Mol.Cryst.Liq.Cryst.* **21** (1973) 211

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[10] P. Sengupta, A. Saupe, *Phys.Rev.A* **9** (1974) 2698
[11] D. Johnson, A. Saupe, *Phys.Rev.A* **15** (1977) 2079

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[12] K. Radley, A. Saupe, *Mol.Cryst.Liq.Cryst.* **44** (1978) 227; *Mol.Phys.* **35** (1978) 1405

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[13] R. Dreher, G. Meier, A. Saupe, *Mol.Cryst.Liq.Cryst.* **13** (1971) 17

[14] A. Jakli, A. Saupe, *Mol.Cryst.Liq.Cryst.* **222** (1992) 101

Recent Papers

7 papers (in addition to the list in the Festschrift):

1. *Surface-imaging of frozen blue phases in a discotic liquid crystal with atomic force microscopy*
   A. Hauser, M. Thieme, A. Saupe, G. Heppke, D. Krüerke, *J. Mater. Chem.* **7** (1997) 2223.
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4. *Tilted smectic layers of a SmC* liquid crystal between homeotropically treated plates*,
   M. Giocondo, A. Jakli, A. Saupe, *Eur. Phys. J.* **1** (2000) 61.
5. *Helical filamentary growth in liquid crystals consisting of banana-shaped molecules*,
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and one book:

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Additional Coauthors

In addition to the 61 coauthors until 1995, there are 21 more afterwards

J. Bajc	X.-H. Chen	S. Diele	M. Giocondo
A. Hauser	G. Heppke	G. Hillig	D. Krüerke
I. Letho	Ch. Lischka	S. Markscheffel	S.-S. Pak
G.G. Peroli	G. Pelzl	M. Schadt	T. Scharf
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Final Remarks

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