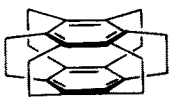
Concluding Remarks

This volume presented a selection of research work in the field of (cyclo-)phane chemistry. The reader may have realized the continuous extension of this topic and its increasing influence on neighbouring disciplines.

In future, synthetic chemistry will increase the amount and value of such phane molecules, the size of which ranges between low molecular and macromolecular compounds. They may be called "*mediomolecules*" with molecular masses between approx. 1000 and 20000 and contain acyclic as well as cyclic exponents — the medio- and macrocyclic compounds. Not only primary structures but also *secondary and tertiary structures* are included into the synthetic strategy directed to such molecules stimulated by further developments of synthetic procedures and of spectroscopic methods. It will be important to find means to handle molecules of this size in solution and to investigate their static and dynamic structures, their intermolecular host/guest interactions and reactions.

Apart from the impetus of phane chemistry to other fields of chemical research work attention should be drawn to desirable molecules, which are pure cyclophane hydrocarbons, however, might effect the design of further, less puristic extraordinary molecular structures. Such target molecules apart from leading to new findings may also simply appear as nice symmetric structures and therefore delight the eye of the "molecular designer" at the end of this volume:
After [2_6]cyclophane, postulated in 1972, designated as "superphane" (*1*) has been synthesized, its hexaene *2* remains to be done and the preparation of the extended [2_6]hexaphenylbenzenophane *3* also can be attacked.



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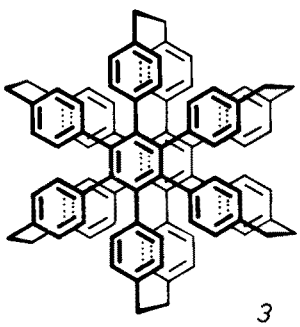

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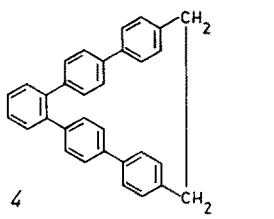

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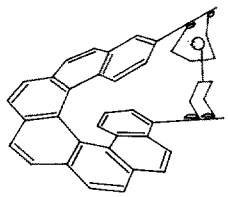

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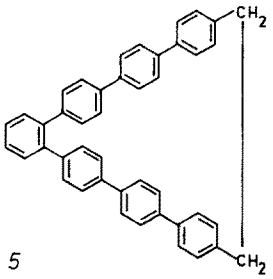

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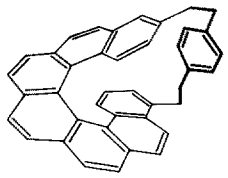

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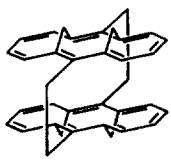
Molecules with only clamped aromatic assemblies like *4*, *5*, in which benzene rings are forced into boat conformations, and also spacered (cf. *6*) helices like *7* will be synthesizable, as well as annulenophanes such as *8* and the phane molecule *9*, which is interpreted with a sensitive artistic understanding to a gyro-wheel. Structure *9* opens the field of tube-shaped aromatic molecules: Will it be possible to succeed in the condensation and aromatisation of the skeleton to end up with a cyclic pyreno/peryleno oligomer?



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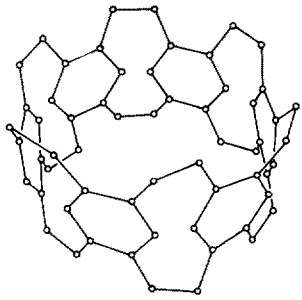

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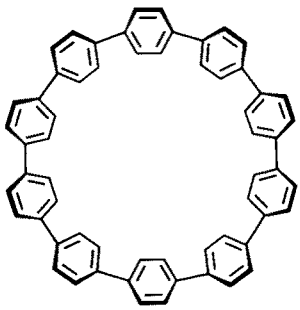
The $[0_{10}]$paracyclophane *10* and similar oligo-paraphenylenes hopefully will be synthesized; they are of interest not only in account of the increasing large ring strain with decreasing ring width.

Tube-shaped molecules looking like bracelettes, for example *11*, fully aromatic or partly aliphatic, belong to the stars under the phanes-to-be. The aromatic representative of *11* might be designated as a "super-acen" in analogy to super-



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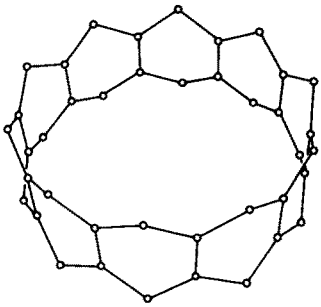

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phane. Apart from questions regarding aromaticity a second point of interest here is coming from the reducibility of the ring width. This aspect reminds of the classic question of the smallest cyclic alkene or alkyne.

By insertion of heteroatoms or affixing of substituents into known compounds, analogues with improved properties of solubility will be available. Obviously, challenges calling for innovations are waiting for generations of chemists. Research connected with structures like and beyond the few ones shown above — and those in the contribution collected in this (and the coming) volume — will impart new conclusions and set up new ideas for future trends based on stronger fundaments.

Cyclophane chemistry as a "bridge builder in the molecular architecture" already led to a directive bridging between research fields and departments, which is also evident in the studies presented.

F. Vögtle

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