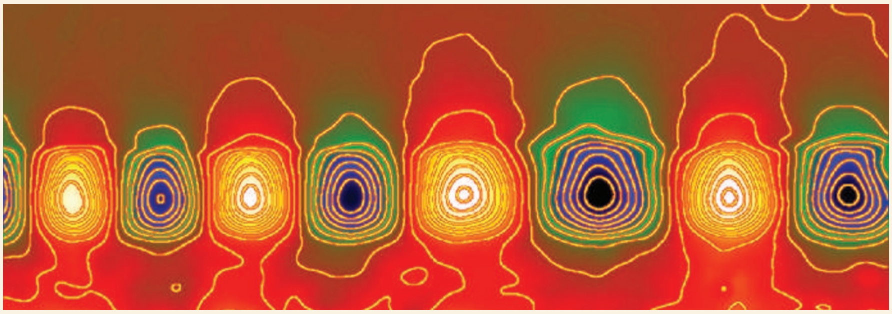
ELECTRON HOLOGRAPHY

Measuring magnetism



Memory devices containing hard disk drives depend on the magnetic interaction between the reading and recording head and the data bits of the storage material. With data density continually increasing, understanding these materials and their interactions on an ever-decreasing scale becomes more and more important.

Now, Aurélien Masseboeuf and colleagues have used electron holography to quantitatively examine the nanoscale magnetic flux distribution in a magnetic film (pictured; *Nano Lett.* doi:10.1021/nl900800q; 2009). The film consists of ordered and disordered domains of iron–palladium on magnesium oxide. Electron holography can separate the magnetic and electrostatic contributions in the reconstructed phase, so simply inverting the sample means the electrostatic component can be removed.

Masseboeuf and colleagues observed that the magnetic domains in the ordered FePd phase were flattened near to the disordered layer, as can been seen at the bottom of the image. Compared with a calculated model, the walls between domains were thicker. The magnetic flux could be accurately measured inside and outside the sample, so the stray field can be related to the magnetization within the domains. These stray fields are the bit information for the reading heads, so this level of understanding should aid the development of improved magnetic data storage media.

NEIL WITHERS

GOLD CATALYSIS

Carbene or cation?

The exact nature of the gold–carbon bond formed during homogeneous gold catalysis has recently attracted a lot of interest and is somewhat controversial. Now a study of the bonding and trends in reactivity of various gold complexes offers new insights into whether such structures can be defined as gold-stabilized cations or gold carbenes.

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Chemists communicate using molecular formulae that comprise a high level of abstraction as well as unavoidable simplifications. Certain aspects of aesthetics and fashion have also had an impact on the way complex chemical entities are represented — as can be easily seen when comparing publications and textbooks of the forties and fifties with those of today. This has occasionally resulted in the sacrifice of chemical rigour.

Chemists are aware that benzene is not 1,3,5-cyclohexatriene (**1**) with alternating single and double bonds because of Kekulé's work in the nineteenth century, but we still prefer this representation to the symmetrical structure **2** (Fig. 1a). Similarly, for the famous and controversial 2-norbornyl carbocation, picture **3** (ref. 1) more precisely highlights the nature of the 3-centre-2-electron-bond with a bridged hypercoordinate carbon atom, but it is more often drawn simply as **4** (Fig. 1b).

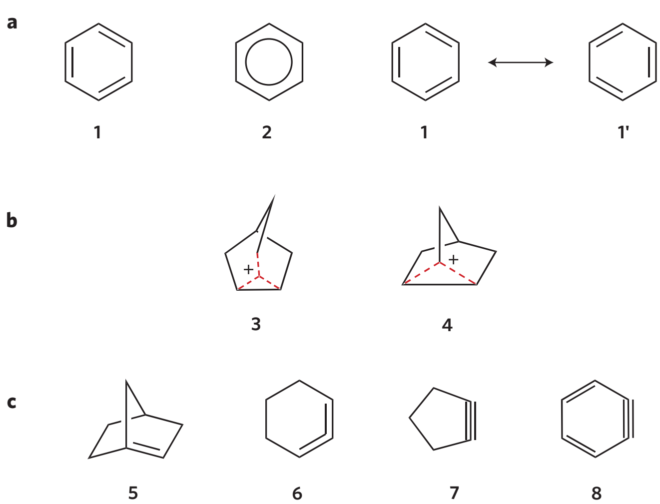

Figure 1 | Comparing preferred chemical structure representations. Different representations of **a**, benzene (**1** and **2**) and **b**, of the non-classical norbornyl carbocation (**3** and **4**). **c**, Conventional drawings of 1-norbornene (**5**), cyclohexa-1,2-diene (**6**), cyclopentyne (**7**) and benzyne (**8**).