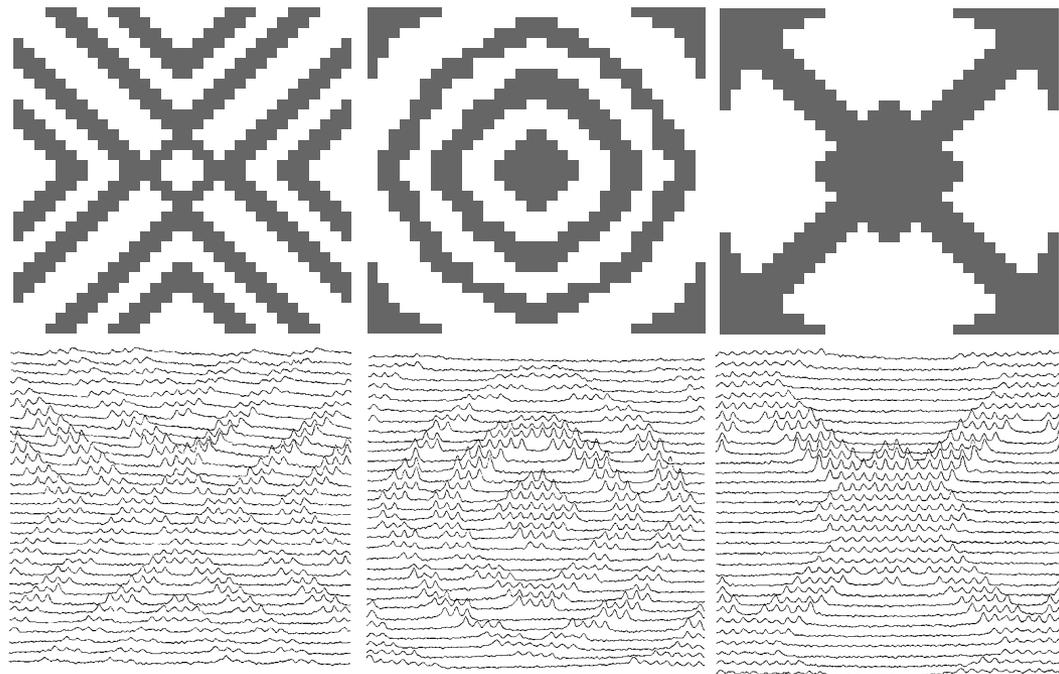


Nuclear Magnetic Resonance Photography

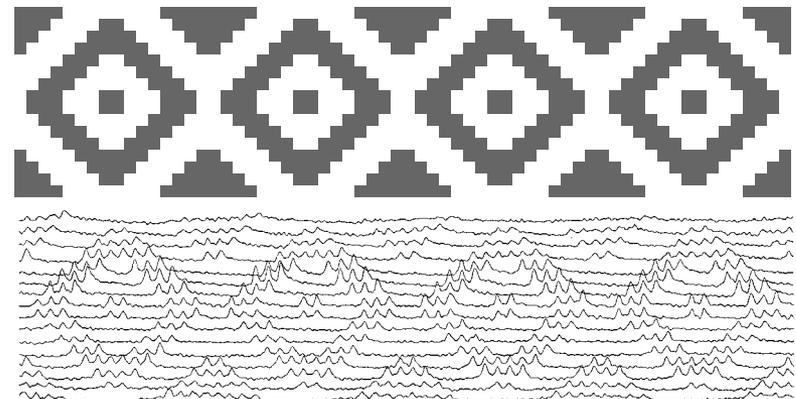
Bing M. Fung, University of Oklahoma. DMR-0090218

The storage and processing of information at the molecular level is an important area of current research. For example, atoms can be placed at specific locations on a surface to form intricate patterns by the use of atomic force microscope. Now we have found how to use nuclear magnetic resonance (NMR) to create spectra that are replicas of digital templates.

The first step in NMR photography is to set the dark pixels in the template into “1” and the light pixels into “0”. Then, the digital array, with corresponding amplitudes, is programmed as a 1024-frequency radio-frequency pulse. The pulse is applied to a liquid crystal sample, and the NMR spectrum obtained is plotted in 32 or 16 segments to reproduce the input pattern.



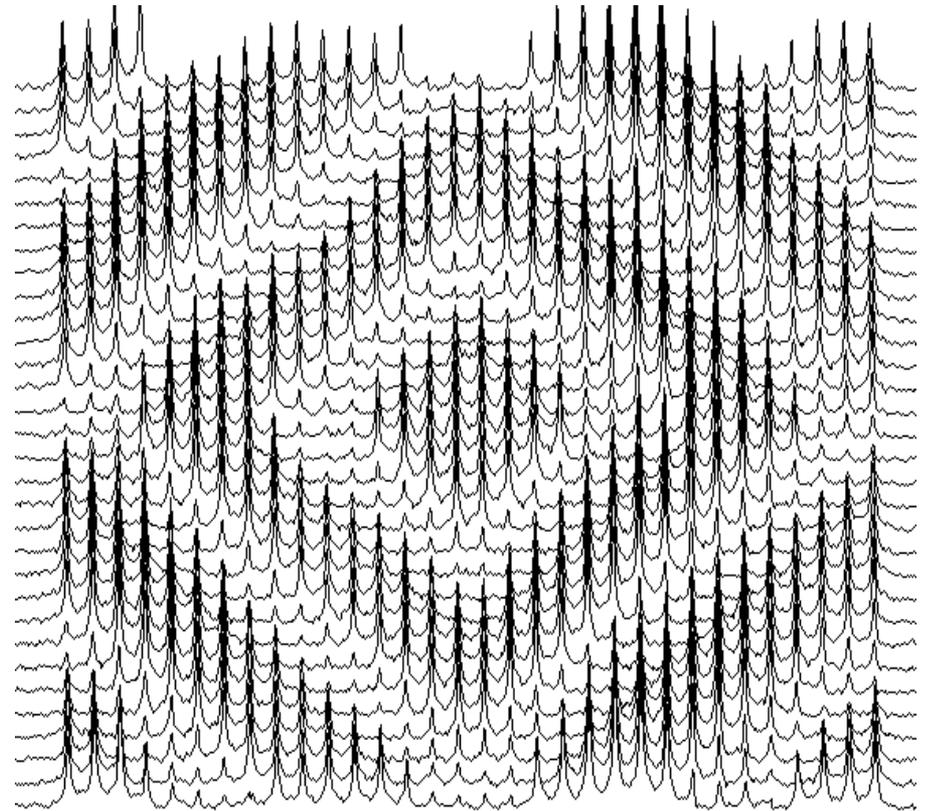
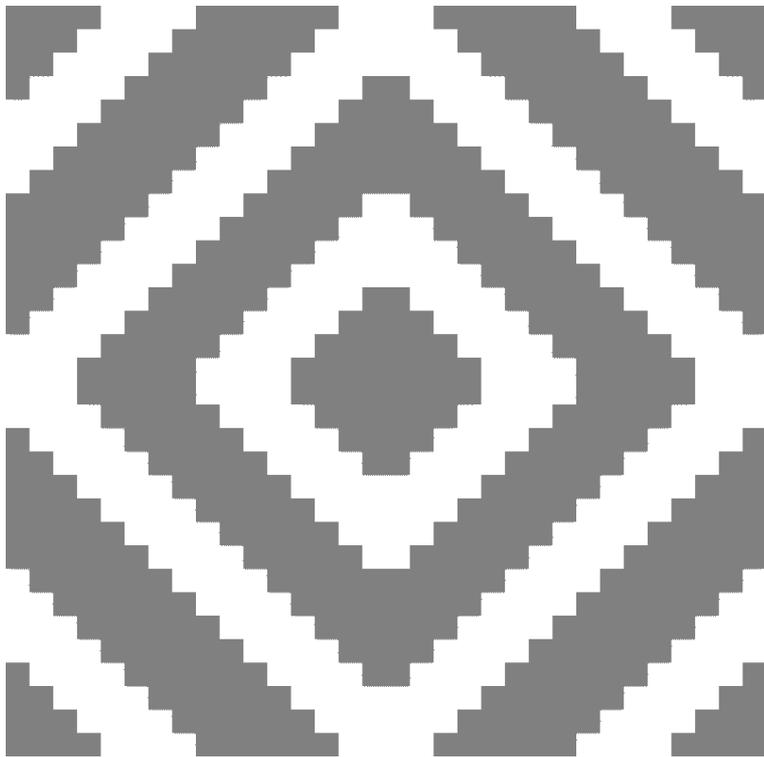
32×32=1024 templates and corresponding spectra



A 64×16=1024 template and corresponding spectrum

Nuclear Magnetic Resonance Photography (continued)

Bing M. Fung, University of Oklahoma. DMR-0090218



These larger figures show another template (left) and the corresponding NMR spectra (right) obtained by using a slightly different experimental procedure. The array of 32 spectra can be seen more clearly.

NMR Study of Liquid Crystals

Bing M. Fung, University of Oklahoma. DMR-0090218

Education:

Training has been provided for two postdoctoral persons and one graduate student in the present granting period.

Outreach:

Demonstrations on liquid crystals were made for two groups of high school students from Meeker, Oklahoma. The groups included 40 students and 8 adults.

Our work on molecular photography was reported on about a dozen websites, including New Scientist and BBC, in several languages.

<http://www.newscientist.com/news.news.jsp?id=ns99993129;>

<http://news.bbc.co.uk/1/hi/technology/2538119.stm>