AlSiMn quasicrystals

Historically, the $Al_{74}Si_5Mn_{21}$ quasicrystal came before AlLiCu, but a complete specification of its structure is still underway. The average 3-d decoration which has been proposed is related to a more complicated 6-d periodic density owing to $A3_{perp}$ volumes not really being 3-d but showing a significant physical space component. The 6-d lattice for $Al_{74}Si_5Mn_{21}$ is, as for $Al_{5.70}Cu_{1.08}Li_{3.22}$, a primitive Bravais lattice but with different density distributions. Diffraction studies are less accurate because single (quasi)crystals are lacking.

The Future

Alternative descriptions based on giant cell periodic crystals, twinned crystals or glasses of icosahedral clusters have been proposed for quasicrystals. Distinguishing between these models is not an easy matter, although electron diffraction and high resolution electron microscopy images have provided support for the fully ordered, quasiperiodic lattice model.

A recently discovered quasicrystal in the AlFeCu system may help to settle the issue once and for all. Its many interesting features have already prompted a wide variety of structural and physical studies. The AlFeCu quasicrystalline phase apparently forms as a stable phase *via* a peritectic reaction from a crystalline primary phase. High quality single grains with dodecahedral faceting can be grown such that the widths of diffraction peaks are limited only by the experimental resolution. Preliminary structural studies show that a chemical order-disorder transition exists where the ordered phase corresponds to a face centered 6-d hypercubic lattice.

The perfection of AlFeCu quasicrystals allows one to identify "lattice defects", *e.g.* using electron microscopy, as being extensions of crystal defects. Grain boundaries, plane defects, stacking faults, dislocations, *etc.*, have been observed, descriptions of which must be made using the 6-d hyperspace periodic structure.

The high dimensional formalism may also be very useful for revealing hidden symmetries in systems that are not quasicrystals. For example, several metallic structures with giant periodic cells are now described in terms of rational cuts through simple hyperspace structures. Generic grain boundaries in normal crystal are very often simple examples of quasiperiodic surfaces. Amorphous alloys may be related to defect distributions in, or modulations of, a high dimension crystal. Structural studies of quasicrystals are certainly thriving, together with parallel investigations of their properties and more elaborate theories for their electronic structures, magnetic behaviour, transport mechanisms and mechanical properties. Guessing where further developments may lead is probably unwise.

FURTHER READING

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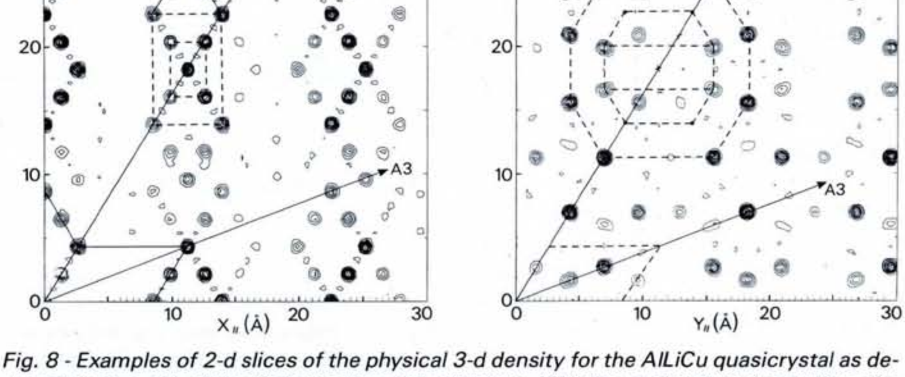

Fig. 8 - Examples of 2-d slices of the physical 3-d density for the AlLiCu quasicrystal as deduced from a cut of the 6-d experimental structure. Midedge and vertex decoration of a 3DPT Penrose tiling are shown for A atoms (left); diagonal sites appear for Li atoms (right).

Edoardo Amaldi

The European physics community, together with all its Italian colleagues and friends, was deeply sorrowed by the sudden death of Edoardo Amaldi on the fifth of December last year in Rome while going to his office at the Accademia dei Lincei, where he was the President.

Amaldi was among the eminent physicists who promoted the foundation of the EPS in Pisa 22 years ago. He continued to maintain a keen interest in the Society, and as an honorary member played a vital role in encouraging collaboration at a truly European level. His work toward furthering co-operation and mutual understanding between eastern and western European countries has a symbolic relevance to-day. Nor should we forget the important and useful advice he offered during his uninterrupted participation over many years in the activities of the Italian Physical Society.

It may even be superfluous to mention his contribution to the creation and development of CERN, acting as Secretary-General of the Council which gave rise to the organization's acronym. He later became the first President of the European Committee for Future Accelerators (ECFA), and in 1963 presented the report that mapped the future of high energy physics in Europe.

In Italy, as professor of physics at the University of Rome since 1937, Edoardo Amaldi was always considered a true Master, leading a large number of physicists in different fields of research and teaching. He figured prominently in the revival of physics in Italy after the Second World War along the lines chartered by Fermi and Majorana. The foundation of the Instituto Nazionale di Fisica Nucleare (INFN) in 1951 — Amaldi was its second President after Bernardini — exemplifies the creation of a very efficient institution which has contributed greatly to the international prestige of Italian science.

The outstanding scientific career of Edoardo Amaldi stretches from his legendary work in nuclear physics with Fermi at the "Via Panisperna" Institute in Rome in the 1930's, to his involvement at the time of his death in research on gravitational waves. One cannot give proper credit in this short summary to his keen interest in the applied and social aspects of science, including the peaceful use of nuclear energy and nuclear disarmament, to which he contributed greatly.

To remember Edoardo Amaldi correctly we need his remarkable ability to recreate the scientific and personal life of an historical figure, as he himself demonstrated for Majorana and Touscheck. His wonderful personality bore witness to the importance of carrying out true research without any concessions; it is a shining example for young physicists.

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