Europhysics Conferences

Reports on Conferences Organized by EPS Divisions & Sections

12th EGAS Conference in Pisa

The 12th Conference of the European Group of Atomic Spectroscopy (EGAS) was held 2-5 September 1980 in Pisa, the city where Galileo Galilei was born and where he made his famous experiment from the leaning tower. This conference, organized by E. Arimondo and A. Gozzini followed the pattern of its predecessors, i.e. emphasis on short contributions and a relatively small number of invited papers.

One invited talk was given by G. Series, Reading, who reviewed 31 years of optical pumping — from the pioneering works of Kastler and Brossel in the late 40's to the present-day research. The field is still very active, although its aims are quite different from those of the early days. In another invited talk, R. Bonifacio, Milan, described a phenomenon which was unknown to most of the audience, namely that of optical bistability. This phenomenon, which was predicted in 1969, can appear in strongly nonlinear materials, and it is expected to have several important applications in the future in connection with various electro-optical devices (see page 3).

Another new and fascinating phenomenon was discussed by F. Laloë, Paris, namely the properties of spin-polarized ^3He and ^1H. Ordinary (unpolarized) hydrogen and helium start to form respectively molecules and clusters, at very low densities. When the spins of the unpaired electrons are aligned, however, these tendencies are drastically reduced, and gas densities up to 10^{16} at/cm^3 have been achieved in the spin-polarized form. It is expected that spin-polarized ^1H and ^3He remain in the gas phase also at $T = 0$ K, ^1H as a boson gas, since the total spin (nuclear and electronic) is integer, and ^3He as a fermion gas. Moreover, spin-polarized ^1H is predicted to display Bose-Einstein condensation and superfluidity as a gas. It is very likely that further work on these elementary systems will give important information on the quantum properties of matter in general.

Other invited talks were given by J. Lehman, Paris, about the use of lasers to investigate various types of chemical reaction; by I. Lindgren, Göteborg, who reviewed our understanding of many-body effects in atomic structure; by J. Hansen, Amsterdam, who gave an example of a very strong and not well understood configuration mixing in halogen spectra; and by S. Haroche, Paris, who reviewed the present state of knowledge of the very highly excited Rydberg states, which have been the object of very intense study in recent years (see for example, S. Feneuille, *EN* **10** [1979] 10 and ESCAMPIG page 8).

Atomic spectroscopy is nowadays more diversified than previously, due to the advent of new spectroscopic techniques, notably those based on various forms of laser. With mode-locking techniques very short and highly repetitive pulses can be produced for lifetime and quantum-beat studies. Single-mode lasers can now operate with good stability and high precision over most of the visible region. Several projects with computer stabilization in order to improve the performance further were reported. One report of a successful test with internal frequency doubling was also given. High-resolution laser-spectroscopy is largely used for the investigation of isotope shifts and hyperfine structure, and considerable progress is being made in these fields. As a large number of lines can now be studied, it is possible to interpret the isotopic shift and to extract the nuclear information more reliably than previously. Also the hyperfine results can now be analysed in a more complete way, particularly when data are available from several terms of a configuration. Several reports were concerned with that problem, and in one case significant departure from the otherwise very successful effective one-body interpretation was reported.

The advent of sources for highly ionized atoms has renewed the interest in optical spectroscopy and term analysis of a more conventional type. Highly ionized spectra are now studied in connection with various particle accelerators, while in the Tokamaks it is possible to observe spectra from heavy atoms which have been stripped of most of their electrons. Data of this type are important for fusion work and they have also great astrophysical interest. Furthermore, systematic studies of isoelectronic sequences give important information about relativistic and quantum-electrodynamic effects in atomic systems.

Another new development in atomic spectroscopy, which is given more and more attention at conferences of this kind, is the use of opto-galvanic detection. This technique has several advantages compared to conventional optical detection, particularly as there is no interference with the incident light. The electrical signals can be amplified and processed so that remarkable sensitivity can be achieved. This technique seems to be applicable in most kinds of atomic spectroscopy.

In conclusion it can be noted that the general feeling among the participants was that the conference had been successful and gave a good review of recent developments in atomic spectroscopy. Abstracts to the papers presented have been published as *Europhysics Conference Abstracts*, Series 4, Volume E.

I. Lindgren, Göteborg

Europhysics Conference on Computing in High Energy and Nuclear Physics

The 4th conference organized by the Computational Physics Group with the above title, took place at the Physics Institute of the Bologna University on 9-12 September. Co-sponsored by the EPS, the Italian National Institute of Nuclear Physics (INFN) and the Institute of Physics of the University of Bologna, the conference aimed at an exchange of information between physicists and computer specialists in two closely related fields, both of which are heavily dependent on the machinery and methods of computing.

Some 150 participants from 15 countries followed the heavily charged programme, squeezed into 7 half-day sessions. They were offered 14 invited lectures, 34 short contributions grouped in 4 (parallel) sessions, and a panel discussion on some of the problems which physicists as computer users have to face daily. In addition, the local organizers offered an impressive cultural and social programme.

The *invited papers* reviewed the state of the art in physics and related computing, and attempted an outlook into the future. Thus M. Mcfarlane (Argonne) and L. Van Hove (Geneva) gave an overview of recent advances in nuclear and high energy physics respectively; K.J.F. Gaemers

(Amsterdam), B. Giraud (Saclay), D. Ponting (Glasgow) and Z. Szymanski (Warsaw) went deeply into a few of those theoretical problems whose solutions owe a lot, if not all, to the existence of large computers.

On the more technical side, the very important role which computers and computational methods play in experiments with large amounts of data, came across very clearly in the talks on "Trigger and Decision Processors" and "Influence of Computational Algorithms on Experimental Design". They showed that a good fraction of the experimenters' ingenuity goes into the clever use of digital processors at all stages of data reduction.

Finally, several talks dealt with recent developments of hardware and general software. Central computing facilities, mass storage, on-line systems, programming languages and libraries, large scale data transmission over long distances, data bases in physics and algebraic computation were discussed and speculations made about their future.

The *contributed papers* were grouped into four half-day sessions. The most popular subject turned out to be "On-line computing", which provided a forum for those numerous and impressive projects where computers, mostly in the form of programmable or microprocessors, have been brought into the data acquisition electronics. In the other sessions headed "theory", "data processing" and "graphics", many lively and interesting exchanges between specialists took place — without perhaps showing trends as clear as the shift towards decentralisation emerging from the "on-line" session.

Personal Impressions

My personal reactions to the four day meeting are as follows. First, there is this clear fact: Large scale integration has brought the performance and price of processing units and memories within reach for a multitude of applications, which gladly use such decentralised intelligence for systems of higher performance and flexibility. Algorithmic techniques are thus entering a domain where previously, simple Boolean logic in hard-wired form, was the end. It is probably safe to say that this development is only at its beginning; the hard-ware market is still evolving fast, and many non-physics applications on a large scale (and of commercial interest) are experiencing the same evolution.

Second, this decentralisation does not seem to have the effect expected by some, of making the familiar large multi-user systems in our computer centres look obsolete. On the contrary, demands on central facilities seem to be growing as ever, which can perhaps be explained by the higher quality output which the more sophisticated systems produce under the influence of added decentralised capacity. To be sure, the type of demand on central facilities does change. There is much demand for storage capacity, fast and reliable peripherals, services like filing schemes, editing and graphics facilities — and, of course powerful and reliable communication between the computers inside a laboratory and from lab to lab.

Last, some well-known problems are still with us. Like a pedal point on the organ, there was a common undertone in many talks, culminating in a plea for collaboration on standards (issued on behalf of a subcommittee of the European Committee for Future Accelerators). The effort to tame all the available systems and to get at the real problem is estimated by many to be larger than necessary, because the physics computing community is not sufficiently organised itself, and not sufficiently guided from outside in anything going beyond the most basic operations. A multitude of solutions is frequently offered for a given technical problem, for which, at best some local guidance is offered. More typically, the user is left to choose himself, a choice he does not want to spend time on. Sometimes, the "suppliers" of solutions even are in open competition. It may well be that the size of the physics and science community has something to do with this. A smaller sized group finds naturally its style of collaborating, and a large community makes the problem so apparent that solutions are enforced. As one participant put it: I wish, the night was over.

The proceedings of this conference will be available later as a special issue of *Computer Physics Communications.* The abstracts are now available as Volume 4G of the *Europhysics Conference Abstracts* Series.

R. Bock, CERN

ESSDERC '80

This year it was the United Kingdom's turn to be host to ESSDERC which was held at York University from 15-18 September. Ten years of solid state device research have seen immense changes in the devices and their associated technology. Large scale integration and now, very large scale integration, are exceedingly demanding on reliability, reproducibility, packing density and power dissipation to name but a few of the problems. This emphasis on technology is reflected by the integration of the Tenth European Solid State Device Conference with the Fifth Symposium on Solid State Device Technology. The importance of technology was emphasised by B.O. Kolbesen and H. Strunk from Siemens, Munich, where Kolbesen had collected a beautiful set of slides illustrating swirl effects and other "Process-Induced Defects in Silicon". The correlations he established between various defects and device failures were impressive. Fortunately, the invited talks in both the symposium and the "main" device conference were joint sessions and there surely must be a case for scrapping the slightly artificial division between the two events which are, in any case, joint events next year. Devices need technology and technology needs devices.

It is appropriate at a research conference to consider the future, and the possible devices of the future are again dominated by technology, especially dominated by the questions relating to the limits to size. Device physics will change drastically if we reduce the size of the devices down to the quantum scale of nano-metres. However, E. Constant of CRNS, Lille, in reviewing this field, wisely limited his main discussions to devices where macroscopic quantities such as momentum, energy, and relaxation times still have some meaning. Monte-Carlo calculations are acknowledged as perhaps the most powerful method of attack, and Constant gave a few examples, which were backed up in later papers, for example, one by C. Moglestue from Reading University on a simulation of