a) one could make a crystal of a pure nuclide, in which the number of atoms were known to a higher precision than I part in 10^9,
b) the atomic mass of this nuclide were also known to at least this precision,

one could base the unit of mass on that of the atomic mass unit defined above, M (^{12}C)/*12* by defining a value for Avogadro's constant.

Collaborators at the National Bureau of Standards in Washington have high hopes that they could, given sufficient funding, fabricate crystals of 99,9999 % pure silicon (with known admixtures of the other two stable isotopes, ^{29}Si and ^{30}Si) which have fewer crystal faults than 1 in 10^9. Then, if the atomic mass of ^{28}Si were known to the same precision (those of the other two isotopes need then be far less accurately known), one could start considering a mass definition along the indicated lines.

The present[8]) mass value of ^{28}Si is : M (^{28}Si) $= 27.976\,9281 \pm 0.000\,000\,7$ which is at least three times less accurate than 1 in 10^9. Moreover, the determination is very indirect : the reported accuracy of the best available direct measurements[9]) is only 14 parts in 10^9. In my opinion, both reported accuracies are overestimated by at least a factor three. We hope to apply the Delft RF mass spectrometer for a satisfactory determination of this atomic weight.

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9th European Conference on Atomic Spectroscopy

The annual conference of EGAS, the Atomic Spectroscopy Section of the Atomic Physics Division, arranged this year by D. Kunisz and her coworkers at the Jagellonian University, Cracow, attracted more than 230 participants from 16 countries among which several east European countries were well represented. The traditional style of EGAS meetings of having a small number of invited talks plus many contributed papers was again followed and, as always, young atomic physicists were encouraged to take the floor.

Laser spectroscopy continues to play a dominant role at EGAS meetings, with several important developments being reviewed in Cracow. Methods based on laser fluorescence today can detect concentrations as low as 10^{-2} atom/cm^3. Recent studies of hyperfine structure and isotope shifts for radioactive sodium isotopes ^{26}, ^{27}, ^{28} Na by laser methods were summarized by P. Jacquinot. E.-W. Otten and collaborators have used laser spectroscopy to measure isotope shifts in radioactive Hg nuclei, produced in the ISOLDE on-line mass separator, CERN. Very abrupt changes in charge radii around $A = 184$ are explained in terms of "coexistence" of two different nuclear shapes which are energetically almost degenerate. Laser methods can thus be successfully applied to study nuclear properties. It seems clear that the technique of exciting atomic or fast ion beams from accelerators with laser light offers fascinating possibilites for future work.

One of the first atomic physics techniques utilizing accelerator beams, beam-foil spectroscopy is well suited to the measurement of radiative lifetimes in atoms and ions. A modified technique based on the spectroscopic study of sputtered, excited atoms has been developed in Aarhus by T. Andersen and his co-workers, and has given the level lifetimes in neutral uranium. Multiply-excited levels are strongly populated when ions interact with solid foils, and recent work from Aarhus shows that these states can also be studied by beam-gas techniques. The spectral resolution obtained in this way can be considerably higher than in traditional beam-foil spectroscopy.

Much interest is presently being focused on level lifetimes in atoms and ions and the related atomic transition probabilities, using laser methods, beam-foil technique, level crossing and intensity studies.

In spectral line classification and term analysis, perhaps the most complex spectra reviewed were those of Np I and Np II where angular momenta as high as $J = 23/2$ have been observed at Orsay. One of the most "popular" elements among atomic spectroscopists is now Mo, many times ionized, because of its role as an impurity in high-temperature Tokamak plasmas.

In optical pumping experiments with alkali atoms, the polarization is usually preserved by using buffer gases such as Ne, Ar, Xe. The interactions between alkali atoms and noble gas atoms contain many interesting problems, but agreement between theory and experiment is usually quite satisfactory. According to T. Skalinski, it would however, be useful to undertake relaxation experiments in larger magnetic fields as an additional test of present calculations.

Pressure broadening of spectral lines also attracts considerable interest. A quasimolecular theory based on the Franck-Condon principle is known to reproduce the line wings quite satisfactorily while the shapes of the line centres are better described by classical impact theory. Recently J. Szudy and W.E. Baylis have developed a unified theory which successfully combines the above-mentioned limited approaches. There are several applications and consequences of such work, e.g. in understanding pressure effects in doppler-free two-photon laser spectroscopy. A whole section of the Cracow meeting was devoted to pressure effects on line shapes which nowadays can be very accurately measured using laser excitation.

As a testing ground for quantum electrodynamics the bound system μ^+e^-, muonium is superior to hydrogen because the proton form factor introduces uncertainties in the latter case. G. zu Putlitz discussed measurements of the hyperfine structure for the muonium ground state, recently concluded at LAMPF, the meson facility at Los Alamos. Observations of Zeeman transitions in a very high and uniform magnetic field have yielded the muonium hyperfine splitting and the magnetic moment of the muon with uncertainties as low as 0.3 and 1.4 ppm respectively. The agreement with theory is excellent.

In addition to invited and contributed papers, the tradition of round-table discussions was continued. The topics dealt with in Cracow were "Term analysis", "Laser spectroscopy", "Highly excited states in atoms" and "Atomic data for fusion".

Indrek Martinson