SCIENCE NOTES AND NEWS

Award of Research Degree

The University of Poona has awarded the Ph.D. degree in Botany to Shri Sudhanshu Kumar Jain for his thesis entitled "Studies on the Vegetation of Arid, Semi-Arid and Some Adjacent Regions of Western India".

Bauchite : A New Variety in the Quartz Monzonitic Series

A coarse plutonic fayalite-bearing rock has been found to be fairly widespread in Nigeria. Around the town Bauchi in Northern Nigeria a single occurrence covers about 20 square miles. Because of its peculiar characteristics which are not adequately conveyed by the general or group name, M. O. Oyawoye, who has described it has proposed the name "bauchite".

The name bauchite is used to denote a dark greenish fayalite-bearing rock of quartz syenite to adamellite mineralogical composition which was first described from Bauchi. Its salient and diagnostic characteristics are : (1) The feldspar of the rock, a microperthite, is dark green in colour and the quartz is brownish-green with resinous lustre. (2) Fayalite occurs in association with amphibole and is commonly arranged in zones. The amphibole is commonly moulded around the plagioclase and the fayalite is usually in a quartz matrix. (3) The rock occurs in plutonic setting commonly fringed by charnockite and surrounded by a plutonic granite.

Oyawoye is of the view that the bauchite originated by an emanation into granite of ferrous iron-rich fluid or magma. The green colour of charnockite and bauchite is believed to be due to impregnation of feldspars with ferrous iron during the emanation—(*Nature*, 1965, 205, 689.)

Two-Particle Theory of Matter

Dr. E. J. Sternglass of Westinghouse Research Laboratories has reported new evidence in support of his electron-positron theory of matter. The essence of the theory is that matter is built up of pairs of electrons and positrons arranged in closely spaced orbits, in which they move together at nearly the speed of light. In a technical paper (*Physical Review*, 1961, 123, 391) Sternglass analyzed the simplest possible grouping, *viz.*, one electron and one positron rotating in an orbit some 100,000 times smaller than the diameter of the hydrogen atom. The system was shown to exhibit the properties and behaviour of the neutral pi meson (π^0).

Two years later, in 1963, this basic model was extended to include two or more electron-positron pairs rotating together, to explain the heavier neutral mesons, and resonance particles that decay into pi mesons.

New calculations reported in *Nuovo Cimento* (1965, 35, 227) extend the basic model still further to account for : (1) the masses and lifetimes of the mu mesons μ^+ and μ^-, and of the pi mesons π^+ and π^-, (2) the small force between the mu meson and other nuclear particles, (3) the "strong" interactions between pi mesons, and (4) the relationship of neutrino to other nuclear particles.—(*Nuovo Cimento*, 1965, 35, 227).

Plasma Diagnostics using the Raman Effect

Much of the recent research in the area of plasma physics has been aimed at determining the importance of certain plasma processes in various applications. The processes of interest include recombination rates, diffusion constants, energy transfer processes and chemical activity in the plasma. In this regard it is essential to obtain experimental data on important plasma parameters such as electron density, ion density, the individual species present and their densities and temperatures.

One technique that is receiving considerable attention is the detection and measurement of Raman effect in light scattering from a plasma. The Raman effect has been used for many years to study the internal structure of the molecules of liquids, gases and solids. The development of the laser has provided an ideal Raman source thus enlarging the application of the method to new fields of study. Now it is feasible to obtain Raman spectra in extremely short times (1 millisecond) of scattering molecules and ions from extremely small areas (1 $mm.^2$) by spot-focusing the highly directional monochromatic laser beam in the scattering medium. This has opened up new possibilities of using a laser beam as a plasma probe for diagnostic study of plasma. By measuring the relative intensities of the Stokes and anti-Stokes Raman lines a determination can be made of the density and temperature of the individual species present in a plasma.

Such a study has been undertaken in the Applied Studies Section of the Space Surveillance and Instrumentation Branch at Rome Air Development Center (RADC). In a preliminary Report to acquaint the workers in the area of plasma physics with a new and promising plasma diagnostic technique, the Study Group has presented the theory correlating the Raman intensity with the specie density and temperature, along with experimental technique and results so far achieved.(*Technical Documentary Report, RADC-64-5.*)

New Laser Material for Automatic Giant Laser Pulses

Westinghouse research scientists have produced a new laser material that automatically generates giant pulses of laser light. Ordinarily, what is known as giant-spike operation for laser emission is achieved by means of complicated optical apparatus placed outside the laser. Now, a new kind of glass laser material developed in the Westinghouse Laboratories enables such giant spikes of energy to be produced within the laser rod itself.

The giant-spike material is a modified form of neodymium glass which is itself well known for its laser action. Ordinary neodymium glass is simply a special high-quality glass to which has been added a small percentage of neodymium ions. This impurity ion is what causes the glass to lase.

In the modified neodymium glass a small amount of uranium in the form of uranyl (UO_2^{++}) ions is added. During 'pumping' both the neodymium ions and the uranyl ions absorb energy. The absorption of the uranyl ions holds back the laser action of the neodymium. This delay allows time for many more neodymium ions to be pumped to their higher energy level before the laser burst occurs.

For the burst to take place, the greater number of inverted neodymium ions finally overcomes the delaying action of the uranium. The laser fires as a giant spike of high power and short duration, with the uranyl ions acting as a sort of built in timer that turns the laser action on at just the right instant. When done externally, this delaying and releasing is known as Q-switching. In the present case the neodymium uranyl rod switches itself.—(*Westinghouse News.*)

Quasi-Stellar Radio Sources as Spherical Galaxies in the Process of Formation

The quasi-stellar radio sources are the brightest objects known. The energy radiated by the quasar 3C 48 has been estimated as 2×10^{46} erg/sec. One therefore asks if there is a phase in the evolution of a galaxy characterized by such a luminosity. It has been pointed out that, very early in the life of a galaxy, the gas density and therefore the rate of star formation would be high. Shklovsky estimated an absolute magnitude of — 23 (minus 23) due to supernovæ alone.

Following Shklovsky's suggestion, G.B. Field of the Princeton University Observatory; has studied the earliest phases in the life of a galaxy, and calculated the properties of a galaxy forming from an intergalactic gas cloud. If a cloud of 10^{11} suns is formed with sufficient angular momentum to prevent the formation of a "massive object", but too little to permit the formation of a disc, a period of vigrous star formation is expected. Rough estimates of the phase of the commencement of star formation yield radii and velocities in the vicinity of those of the quasi-stellar sources. It is found that the radiation emitted by the young stars in such a system is of the order required in the quasars.

The crucial point is the suddenness of star formation associated with the rapid rise of gas density in the contraction of a slowly rotating system.—(*Astrophys. Jour.*, 1964, **140**, 1434.)

Endeavour Prizes

Imperial Chemical Industries Limited, Publishers of the International Scientific Review *Endeavour*, award prizes totalling 100 guineas for essays submitted on any one of the following subjects: (1) *Physics of the Moon*, (2) Physiological basis of memory, (3) Molecular sieves, (4) Chemicals from oil, (5) Mechanisms of enzyme action and (6) Strength of materials.

The competition is restricted to younger scientists, whose twenty-fifth birthday falls on or after 1st September 1965. Only one entry is permitted for each competitor. The essay, which must be in English and typewritten, should not exceed 4,000 words in length and should reach the undersigned before 1st June 1965. The Deputy Secretary, British Association for the Advancement of Sciences, 3 Sanctuary Buildings, Great Smith St., London S.W. 1.

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