tive cooling method that is used to create the superfluid droplet affects only the most energetic atoms in the gas. A more likely model, therefore, is that at the birth of a superfluid droplet, its energetically lowest-lying collective vibrations are excited by quantum 'noise' in the surrounding atomic gas. The result is a 'fuzzy' quantum object, whose strongly oscillating nature initially hinders growth. After these vibrations have largely damped down, the droplet can grow further by the classical, collisional process already mentioned.

So how can we observe the quantum nature of the nascent superfluid droplet? This requires a measurement that is sensitive to non-local properties spread over a large part of the Bose–Einstein condensate. A particularly dexterous possibility is to perform an interference experiment in which the atomic cloud falls through a double slit (Fig. 1). Ritter *et al.*[2] in essence perform this experiment, with a double slit created by microwave fields that preferentially extract atoms from the condensate in two different places, and an interference pattern analysed by looking at the number of detected atoms as a function of time.

Hugbart *et al.*[1] implement another possibility, using an ingenious spectroscopic method to measure the number of atoms in the Bose–Einstein condensate that have a certain velocity. Notwithstanding the quite different methods, both experiments clearly show the fuzzy, vibrating quantum nature of the superfluid droplet at birth. The main difference between the findings of the two experiments lies in the precise nature of the vibrations that are excited. Hugbart *et al.* observe quadrupole-shaped oscillations of the droplet, whereas Ritter *et al.* observe subtle fluctuations in superfluid flow that hardly affect the shape of the droplet. This difference is possibly related to the much more elongated shape of the superfluid droplet in Hugbart and colleagues' experiment, although more work is required to clarify the reasons for this qualitative difference.

These experiments[1,2] allow us a first glimpse of the birth and initial growth of a Bose–Einstein condensate. That is already leading to new qualitative insights into this fundamental process, but the experimental results cry out for the detailed, quantitative comparison with theory that will allow a precise understanding of the process. A further attractive option is to study the birth of the superfluid droplet in the presence of an optical lattice — a web of laser beams that creates a regular array of sites to which the atoms of the ultracold gas are attracted. For a sufficiently attractive optical lattice, the Bose–Einstein condensate would have to form not from a normal gas, but from yet another phase of matter, a Mott insulator, in which every site of the optical lattices is filled with exactly one atom. Ritter and colleagues also have experience with creating these states, so such an experiment might not be too difficult for them to carry out. ■

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MOLECULAR BIOLOGY

RNA in control

Benjamin J. Blencowe and May Khanna

In bacteria, some messenger RNAs can sense the need for their protein product and accordingly regulate expression of their own genes. A similar type of RNA regulation has now been revealed in higher organisms.

The functional capacity of RNA, beyond its role in protein synthesis, frequently amazes, as examples of RNA-mediated gene regulation are continuously emerging. One type of such regulation found in bacteria involves RNA structures called riboswitches. These are sequences of nucleotide bases in messenger RNAs that contain structural domains called aptamers. Aptamers act as sensors by binding to a specific small-molecule building-block, or metabolite. The protein product of the riboswitch mRNA is often involved in the biosynthesis or transport of the same metabolite[1]. On binding to a metabolite, aptamers undergo a conformational change that alters the mRNA's access to the machinery required for either its transcription from a gene or its translation into a protein. Thus, riboswitches regulate the intracellular levels of bacterial metabolites. However, it was not known whether they have similar functions in eukaryotes (fungi, plants and animals). On page 497 of this issue, Cheah and colleagues[2] reveal a mechanism by which riboswitches regulate the expression of genes involved in vitamin B_1 biosynthesis in the fungal species *Neurospora crassa*.

50 YEARS AGO

Completion of construction on the Dounreay fast reactor is expected towards the end of the year... One of the main objects for the Dounreay reactor will be to develop fuel elements capable of burning fissile atoms rapidly, and able to withstand high heat ratings with high outlet temperatures for the coolant. The use of plutonium as a fuel will be investigated, to illustrate the economics of a system based on the breeding of plutonium from natural or depleted uranium. The economics of the chemical processes required to handle highly active irradiated fuel will form part of this study, since there is no requirement for separation of 'poisons' in the shape of fission products with high capture cross-section for neutrons, but rather a means of re-forming fuel which may have suffered extensive mechanical damage from the fission process.
From *Nature* 25 May 1957.

100 YEARS AGO

The Khasis are a tribe inhabiting the Khasi and Jaintia Hills in the Indian province of (as it is now called) Eastern Bengal and Assam. They are surrounded on all sides by alien peoples, Tibeto-Burman and Aryan, and are believed to be a survival of a primitive Austro-Asiatic race that once occupied the whole of eastern India until they were conquered and dispossessed in prehistoric times by an invasion of Tibeto-Burmans. The tribal constitution is strongly matriarchal. Inheritance is through the female line, the youngest daughter being the chief heir of her mother; ancestral property can only be owned by women, and the only property which a man can possess is that which is self-acquired. The chief deities are all female. So is the sun, while the moon is represented as a man, and in grammar and vocabulary the feminine element is much more prominent than the masculine.
From *Nature* 23 May 1907.

50 & 100 YEARS AGO