50 & 100 YEARS AGO

50 YEARS AGO

"An Uncollected Report of the Great Sea-serpent" — Though trivial by itself, it corroborates a number of more detailed accounts of a similar monster in the North Atlantic towards the end of the eighteenth century. Thomas Holcroft...describes an interview on board the *Kennet* (Captain Thompson). After recounting two second-hand stories of the Kraken and comparing these with Pontoppidan's versions, Holcroft continues: "Finding this Leviathan so familiar to their belief, I next inquired if they had heard, or knew any thing of the sea-snake, by some called the sea-worm? To this question I received a still more direct answer. The Mate, Mr. Baird, who certainly was not a liar by habit, whatever mistake or credulity might make him, assured me that, about midway in a voyage to America, in the Atlantic, he had himself seen a fish, comparatively small in the body, of from forty to fifty fathoms in length; and that it had excited great terror in the Captain, who was well acquainted with those latitudes, lest it should sink the ship."

From *Nature* 8 October 1955.

100 YEARS AGO

"Type-Writing by Telegraph" — ...what a type-writing telegraph has to do is the following:—it has to receive a message and translate it into a series of time or magnitude signals; to transmit these signals electrically over a wire, and to re-translate them into a series of space signals.

...There can be no question after the perusal of Mr. Murray's paper that [his system] possesses many advantages over its forerunners which should enable it to survive. It is stated that the automatic part of the apparatus can be run perfectly up to 200 words (1200 letters) a minute, but that no typewriter will stand the strain of being run at this speed, a maximum of 120 words being all that is allowable.

From *Nature* 5 October 1905.

rhizoxin occurs outside the host, it diminishes over time. This may, however, simply be a consequence of an artificial medium that was not entirely favourable to bacterial growth, and does not necessarily mean that the bacteria cannot sustain toxin production in the absence of a host. *Burkholderia* bacteria are known to cause disease in plants[2], but the fact that they do so in a symbiosis with a fungus is a new finding.

So what's in it for the partners? At this stage, we can only speculate, but there could be several benefits for the bacteria. For example, the fungus may act as a vector for rapid bacterial dispersal to new roots. Further, much plant tissue is difficult to degrade, but fungi are particularly well equipped with the enzymes to do this; presumably, the bacteria reap the benefits of their toxin production when the fungus digests the dead plant cells. For the fungus, toxin release results in a supply of dead organic matter to digest and perhaps also deters other competitors.

More than 125 years ago, biological symbiosis was first defined by Anton de Bary as simply the cohabitation of two different organisms[6]. Since then it has gradually become clear that the spectrum of relationships varies from beneficial mutualism to outright parasitism. Partida-Martinez and Hertweck's work adds a fresh aspect to our understanding of such relationships — that the apparently beneficial existence of two organisms can occur at the expense of a third one. ■

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CONDENSED-MATTER PHYSICS

Melted by mistakes

Edward J. Kramer

Two-dimensional polymers are potentially useful structures — if we could only understand their properties. Observations of one polymer's intricate, two-stage, melting transition may help us do just that.

Can the polymers from which moulded shoe-soles are made assemble themselves into two-dimensional repeating structures accurately enough to create materials for certain magnetic and semiconductor applications? Such an advance could replace the expensive electron and X-ray-lithography techniques needed for these uses. Writing in *Physical Review Letters*, Angelescu *et al.*[1] contribute to this vision with experiments that further our understanding of the ordering processes of certain polymers. They also test a theory that the melting of two-dimensional crystals results from heat-induced defects in their structure.

Generally, thin films of block copolymers — polymers comprising blocks of at least two different molecular chains joined covalently — are cast and heated to form a disordered melt monolayer. This monolayer can be cooled to create ordered patterns, on scales of 20–50 nanometres, that can be replicated in underlying layers of inorganic material[2]. In films of the 'A–B diblock' copolymers investigated by Angelescu *et al.*[1], spherical domains of polymer B are surrounded by continuous domains of polymer A (Fig. 1a). In thick sections, this structure forms a regular array below an order–disorder transition temperature of 121 °C; above this temperature, the packing is liquid-like. When applied as a 30-nanometre-thick film to a silicon oxide substrate, the polymer diblocks assemble into a hexagonal array of spheres of B above a brush-like layer of A and B.

The melting of analogous two-dimensional arrays consisting of atoms (xenon on graphite, for example), liquid crystalline molecules or colloids has been investigated over the past two decades, driven by the development of the KTHNY theory[3–5]. This theory — named after the initials of its originators — predicts that the transition from crystal to liquid can be split into two transitions. These transitions, which occur at different temperatures, are associated with the formation of isolated defects known respectively as dislocations and disclinations (Fig. 1b). The intermediate, 'hexatic' state has previously been identified by direct imaging in two-dimensional arrays of block copolymers[6], magnetic bubbles[7] and most[8–10], but not all[11], two-dimensional colloids. In this state, the correlation between the orientations of the 'bonds' of one domain and those of other domains decays only slowly, as a power law, with the distance between the domains. (In the crystal, this orientation correlation does not decay, whereas in the liquid it decays over a few particle diameters.)

In the KTHNY theory, order in the two-