tive. Also, an expression plasmid bearing the *noggin* gene under the control of a β-actin promoter can partially rescue a dorsal axis in embryos made uniformly ventral by early irradiation with ultraviolet light. The promoter is not active until the mid-blastula transition, and so active levels of protein are unlikely to have accumulated until gastrulation. This also suggests that the activity is exerted during and not before gastrulation. This story should warn us that the biological activity displayed in the original isolation of a molecule may not be its only or most important activity.

It is now generally recognized that three types of condition have to be met by any substance claimed to be an inducing factor. These can be summarized as: expression, activity and inhibition. Expression means that the substance must be secreted by the signalling tissue at the right embryological stage and in a quantity adequate to do its job. Activity means that the substance should display an appropriate biological activity, preferably in an *in vitro* system so that the 'adequate quantity' can be established. Inhibition means that if the substance is taken away *in vivo*, either by mutation or by some biochemical inhibition, then the induction should fail.

Smith *et al.*[2] enable us to say that *noggin* has passed the activity test. The previous expression study shows appropriate expression at the RNA level. The protein pattern now needs to be studied and it will be particularly interesting to find whether, as one might predict from the embryology, noggin protein is distributed in a dorsoventral gradient. Most important, a convincing inhibition experiment must be performed to show that *noggin* is actually needed for dorsalization *in vivo*. This may prove difficult as targeted mutagenesis is not possible in *Xenopus*, the antisense method has so far been successful only for maternal genes[17], and the dominant negative method, so successful for inhibition of fibroblast growth factor and activin function, requires knowledge of the structure of the receptor.

Assuming that noggin does hold up as the dorsalizing signal, what are the implications for the future? First, it opens the way for a detailed study of dorsoventral patterning. We should find out whether noggin is itself a morphogen, or whether it lifts an inhibition normally repressing muscle and kidney formation in the ventral region. Doubtless there is also a whole battery of noggin-inducible immediate-early mesoderm patterning genes which will now be fished out by differential screening. Second, it will be interesting to find the receptor for noggin and to look at the signal transduction pathway. In 1958, Ogi reported[18] that various salt solutions could dorsalize *Triturus* VMZs. The only one of these to work on *Xenopus* is zinc chloride. Although not very specific, Zn is now known to be an inhibitor of tyrosine phosphatases, so we might tentatively predict that the noggin receptor will be a tyrosine kinase. Third, we can be sure that noggin will be isolated and its function investigated in other vertebrates. People are often rude about *Xenopus* because of its lack of usable genetics. But *Xenopus* goes on producing breakthroughs in developmental biology and, doubtless even as you read this, there are scientists busily cloning *noggin* out of the mouse and the zebrafish, those organisms so eminently favourable to the discovery of novel molecules by genetic means. □

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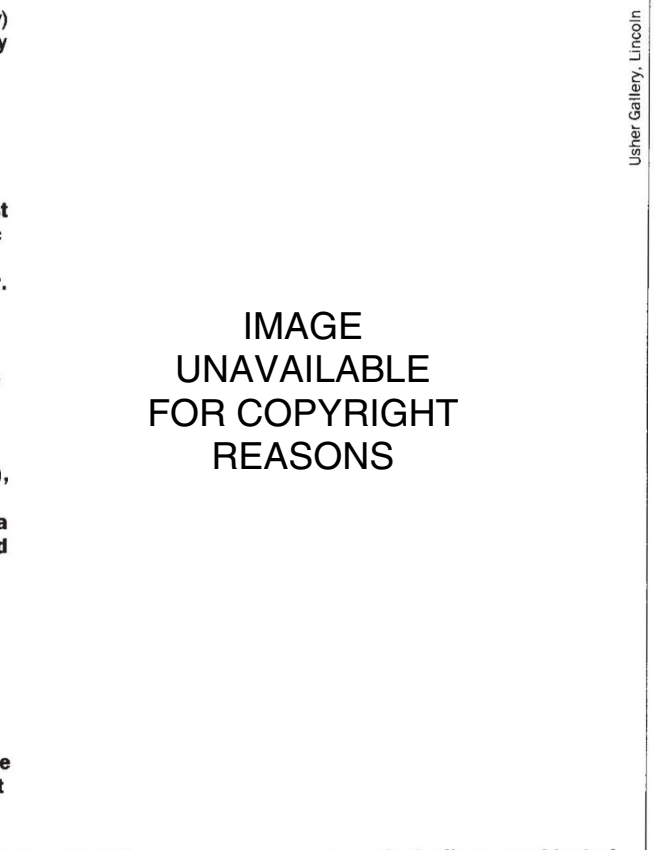
Sir Joseph Banks at 250



Usher Gallery, Lincoln

This month (13 February) is the 250th anniversary of the birth of Joseph Banks, a man born to a fortune who used it to good effect. Banks is best known as a botanist and as an indefatigable enthusiast for voyages of scientific exploration, both as participant and sponsor. He journeyed, for instance, to Newfoundland and Iceland. But these were side shows compared with the epic voyage of the *Endeavour* under James Cook (1768–71), which put New Zealand and east-coast Australia on the map and resulted in a vast haul of botanical, zoological and ethnographical specimens. In this portrait, by Benjamin West, he is seen on his return, self-confidently displaying some of the artefacts gathered in the South Seas. Throughout his long life (he died in 1820), Banks had fingers in a multitude of pies. His influence was enormous — principally as president of the Royal Society, a job which he held for 42 years, and as a friend of George III, and generally as a fixer and mover in scientific, trading and agricultural ventures. The scale of his activities is reflected in his correspondence, which was dispersed after his death but copies are now being reassembled by the Banks Archive at the Natural History Museum in London. The Royal Society will host a birthday party, in the scholarly form of a conference entitled *Sir Joseph Banks: A Global Perspective*, on 22–23 April. Details of the meeting are to be had from Rex Banks at The Natural History Museum, Cromwell Road, London SW7 5BD, UK. T.L.

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