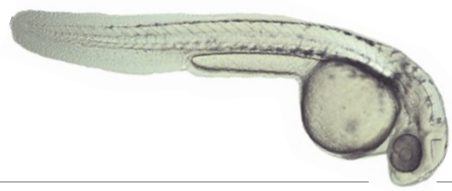
HIGHLIGHTS



MODEL SYSTEMS

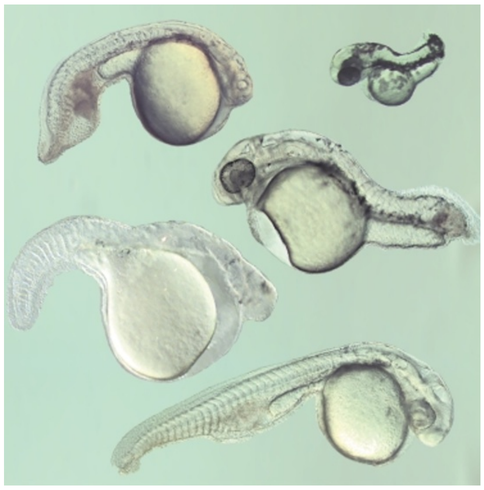
The dawning of the Age of Pisces

It may not be a system as popular as *Drosophila* or the mouse for neurogenetic studies, but the zebrafish is quickly becoming a prime tool in our quest for the relationship between genes and brain function. Several screens have already identified genes essential for the development of this vertebrate, and the promise that the whole sequence of the zebrafish genome will be completed in about two years guarantees that this creature will be the subject of an even more extensive genetic analysis. In preparation for the bonanza to come, two recent papers explore two experimental angles — one genetic and one psychophysical — which illustrate the wide spectrum of opportunities that the study of the zebrafish can offer us.

First, Nasevicius and Ekker tested the possibility of knocking down zebrafish genes by injecting modified oligonucleotides known as morpholinos. Morpholinos act by blocking the initiation of translation, which reduces the non-specific effects observed with conventional antisense oligonucleotides. The authors injected diverse morpholinos into the yolk of embryos as young as the one-cell stage and found that the oligonucleotides reduced the expression of targeted proteins effectively. More importantly, morpholino injections phenocopied previously described mutations in some of the target genes and, in other cases, led to the appearance of new phenotypes, which could help to determine the role of genes of unknown function. Although this technology still has some limitations, the use of morpholino oligonucleotides can become a faster, efficient alternative to the production of knockout animals and it could allow the use of classic reverse-genetic approaches in the zebrafish.

Most of the genetic screens done in the zebrafish so far have focused on mutations that affect embryonic development. However, the behavioural repertoire of this species could also be exploited if we develop the appropriate tools. By studying the optomotor behaviour of larval zebrafish, Orger *et al.* have provided us with a good lead to tackle the problem. When a grating is moved under normal fish, they will swim in the direction of the perceived motion (see movies of the stimuli online). The authors asked what features of movement perceived by the fish are responsible of eliciting the swimming behaviour. They found that both first-order, luminance-modulated features and second-order, contrast-modulated motion were equally capable of triggering optomotor responses, a surprising finding considering that only mammals have been thought to detect second-order motion.

In addition to challenging the idea that cortical processing is required for the detection of second-order motion, the basic characterization of the optomotor reflex provided by this work should increase the usefulness of this task for the behavioural screening of mutant fish. The Orger *et al.* study,



Images of mutant zebrafish taken, with permission, from *Nature Genet.* **26**, 216–220 (2000) © Macmillan Magazines Ltd.

together with the findings of Nasevicius and Ekker would seem to indicate the delayed arrival of the Age of Aquarius.

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References and links

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ENCYCLOPEDIA OF LIFE SCIENCES Transgenic zebrafish production | Zebrafish embryo as a developmental system

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