

Presenting VAST BioImager™: A new modular, expandable platform to automate the orientation of 2-7 day old zebrafish larvae for imaging

Union Biometrica, Geel, Belgium, Union Biometrica, Holliston, MA, USA
Yanik lab, MIT, Boston, MA, USA

VAST BioImager: whole organism imaging

Vertebrate Automated Screening Technology BioImager or VAST BioImager is a new modular, expandable platform to automate the positioning of 2-7 day old zebrafish larvae for imaging applications. The system automatically, precisely and reproducibly orients zebrafish larvae in the field of view of an imager obsoleting manual manipulation while maintaining viability. Based on technology from the Yanik lab at MIT, VAST BioImager automates zebrafish handling and cellular-resolution imaging. It will replace and accelerate what until now has been tedious and time consuming manual preparation of each larva for imaging, thereby making large screens practical.

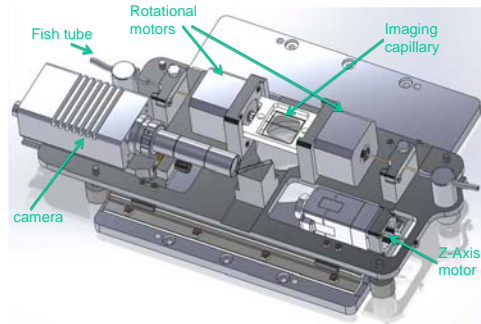


Figure 1. VAST BioImager base system

The base VAST BioImager system is for whole zebrafish organ-level bright field imaging of 2-7 dpf sedated larvae. The system loads, positions & rotates a larva to a user selected orientation in the field of view of the on-board 10µm resolution camera. Using a mouse the operator captures an image then ejects and loads another larva from a bulk reservoir. This manual mode allows dispensing into either of two receptacles.

The HTS software package automates the basic analysis steps of loading a larva from a bulk reservoir, positioning in front of the on-board camera, rotating to a pre-selected template position, capturing an image and ejecting the larva to a single bulk receiver. This package quickly captures images of all the larvae in your sample.

VAST BioImager Options

The modular system is designed to be expandable / upgradeable so it can grow as projects and budgets change:

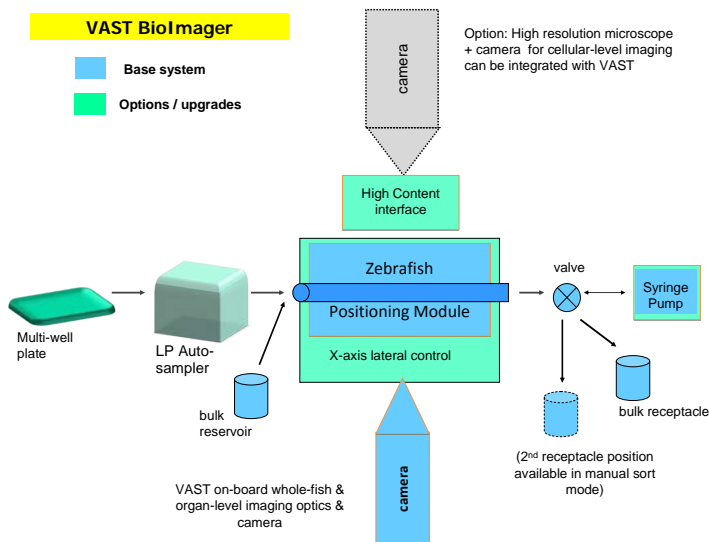
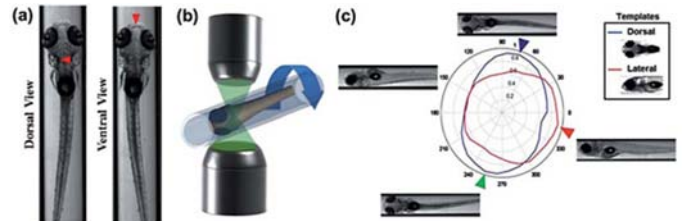


Figure 2. VAST BioImager system with options / upgrades

Automated Orientation



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- Dorsally and ventrally oriented larvae. Red arrows indicate the dominant morphological features for distinguishing dorsal versus ventral views.
- The larva is rotated along its longitudinal axis through a full 360° and snapshots are acquired at two degree increments at 180 frames per second.
- The system then correlates the images with a library of prerecorded dorsal and lateral images from stage matched control larvae (inset). The blue and red curves in the radar chart are results of the image correlations with the dorsal and lateral templates. The blue, green, and red arrows indicate the orientations of maximum correlations with the dorsally, ventrally and laterally orientated templates, respectively. The reliability of the algorithm is 99% (n = 100 larvae).

User Interface / Software

Sample screen captures during rotation:



Conclusions

Interest in using zebrafish as a model organism has been expanding rapidly and imaging is a preferred screening tool. But until now the practical size of screens has been limited by the speed of manual manipulation. The new VAST BioImager obsoletes tedious manual manipulation of zebrafish larvae by automatically, precisely and reproducibly orienting larvae for high throughput imaging while maintaining viability of the fish for further testing.

In addition to the base VAST BioImager system the following options will be available from early 2013:

- Automation Software for walk-away operation
- LP Sampler (large particle autosampler) with VAST BioImager system Integration
- Fine positioning stage with microscope mounting kit for your dissecting or high resolution microscope.

Additional options will be introduced later.