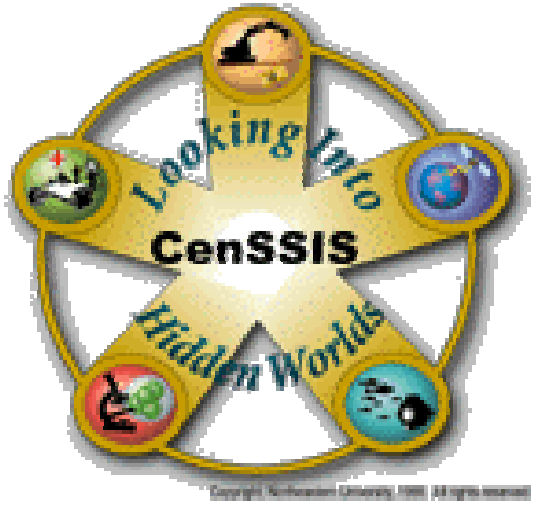
Third Generation Quadrature Tomographic Microscope



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GOALS

We are developing a new optical technique,Quadrature Tomographic Microscope (QTM), and image processing that is able to look at objects that are transparent. and be able to see the internal configuration of them. These objects can include zygotes, fiber optics, and other small objects.

SIGNIFICANCE

The QTM provides a non-invasive, non-destructive way to determine the fertility of a zygote.

The QTM will allow biologist a way to construct a 3-dimensional model of internal configuration of a cell.

The QTM will allow biologist to finally determine what changes go on during the time between the 8 cell stage and the 16 cell stage of the a embryo that produce index gradients too small to see with DIC.

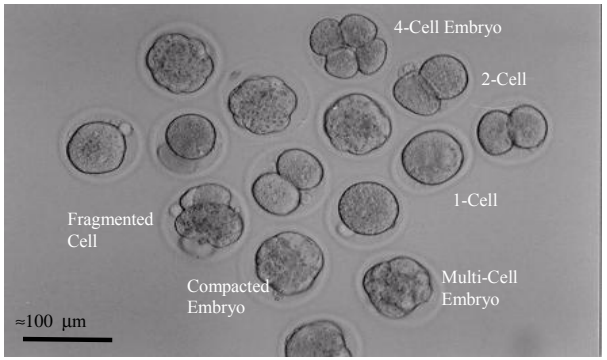

Image by Carsta Cielich in Carol Warner's Laboratory at Northeastern University

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Figure 1.- Examples of Embryos and or Zygote that will use the QTM in determining the fertility of the Embryo or the Zygote.

CURRENT STATUS

Development of higher quality image processing of data collected from QTM

Redesign the QTM to be able to incorporate the ability to interchange objective lengths

Design the QTM to produce better data and be easier to use, by developing Graphical user interface programs for data analysis and automating the data acquisition process.

Design new components for commercially available microscope which can be compatible with QTM module

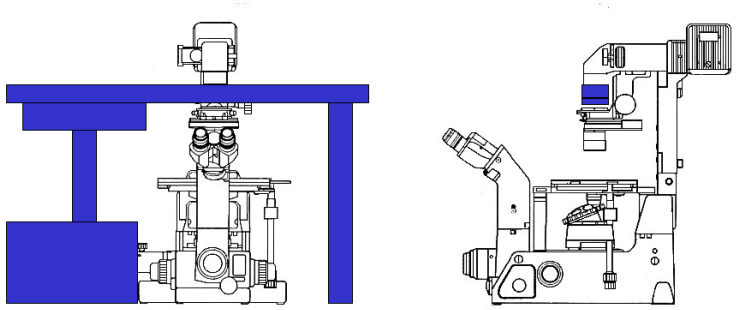

Figure 2.- Experimental setup for the QTM. The required are for the QTM in the initial stages of using an commercially available microscope.

PROJECT EVOLUTION

Prior years

The development of the QTM was designed and fabricated by Dr. Chuck DiMarzio, who patented the optical configuration of the design.

Within CenSSIS

In the first year we will redesigned the QTM so that it was a modular component of a Nikon TE 200 advanced biological research microscope

We will develop an advanced image processing program that takes advantage of the abilities of the commercial available microscope.

In the second year we will be able to obtain results dealing with fertility of mouse eggs by looking at mitochondria distribution and counting cells in the inner cell mass.

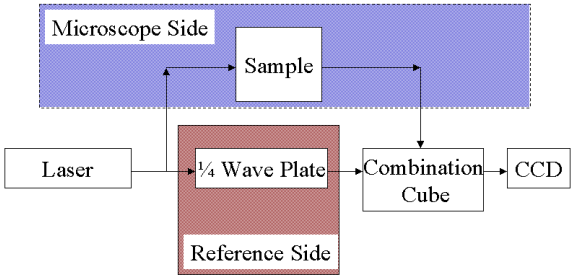

Figure 3.- The basic concept behind the Quadrature Tomographic Microscope

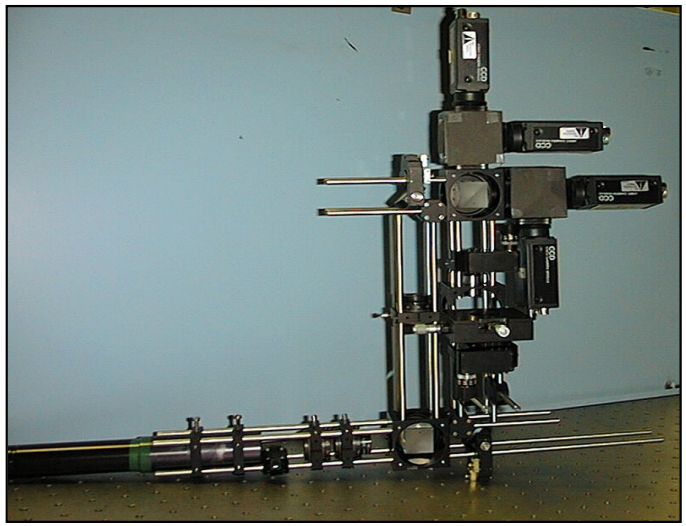

Figure 4. Second Generation of QTM microscope

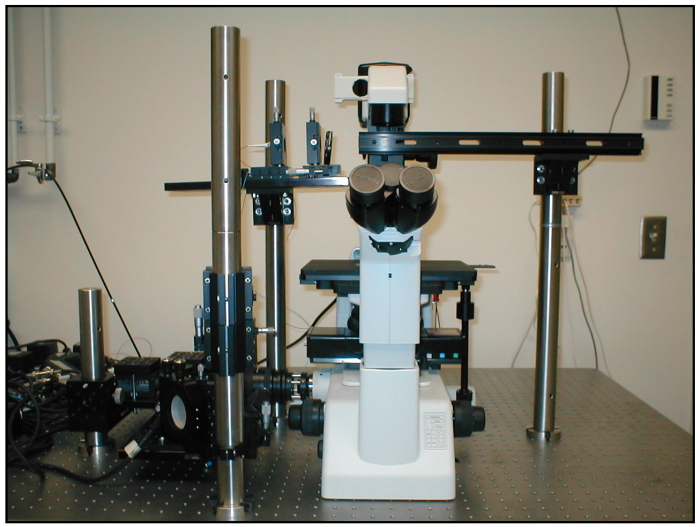

Figure 5. Third Generation QTM, with the incorporation of Nikon TE 200 microscope.

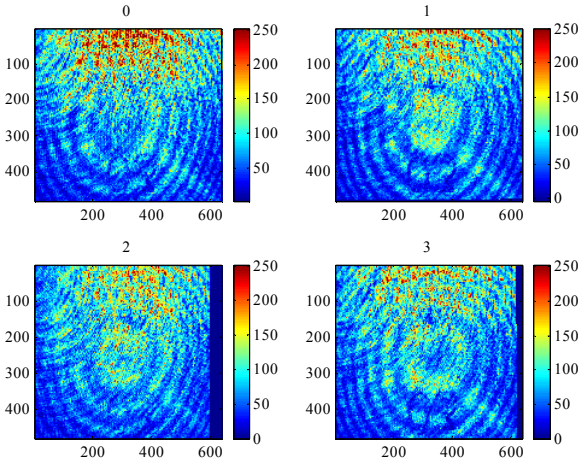

Figure 6. Image produced by old image processing

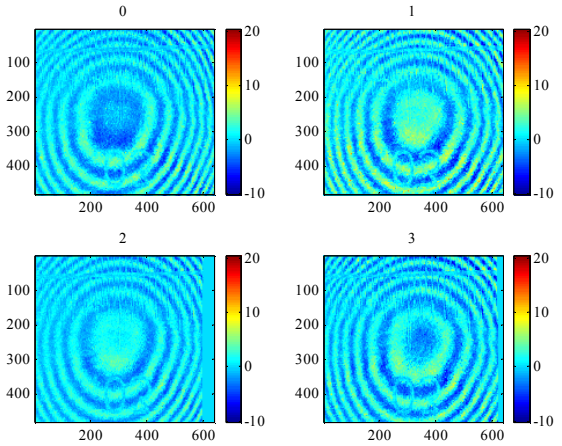

Figure 7. Image produced by new improved image processing

RELATION TO CenSSIS

The QTM project is accomplishing long term sustainability by obtaining other grants, such as the Keck Foundation Grant for new technologies

The QTM project has an interdisciplinary basis within CenSSIS. This project is closely tied to a team of biologists who are addressing the fundamental issues associated with embryo viability.

The QTM contributes to the R3 effort by producing data that is required for a full-scale 3D model of a zygote.

The QTM contributes to the Biobed, in producing new data that can be used in CenSSIS R2 level.

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