

The Mobile Embryo Application

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Abstract

Embryologists worldwide use the Carnegie Collection of Embryology at the National Museum of Health and Medicine (NMHM) to define normal human embryo development. Scientists at Louisiana State University (LSU) have created 3D reconstructions and animations from the collection. A new mobile application, called the Embryo App, incorporates information about embryos into a publicly-available, interactive format. The NMHM website delivers a manual of embryology that received 1450 page views in a three-month period mostly from educational institutions. The Embryo App will allow for expansion of the user base and improve accessibility to existing users. Mobile devices give a tactile functionality to existing data. The Embryo App includes videos on fertilization and in-vitro fertilization, a pregnancy calculator, and a lab manual section. The lab manual presents photographs, 3D reconstructions, animations, reference labels, and information on the early stages (1 through 23) of embryonic development. The application links to social networks and to extended resources from the National Library of Medicine, LSU, National Museum of Health and Medicine and other institutions. The Embryo App provides a new venue for scientists, students, and the public to access and interact with the Carnegie Collection of Embryology for the first time. User evaluation will provide further information needed to improve the application and expand the outreach of NMHM.

The opinions expressed herein represent those of the author and not the Department of Defense or its components, the National Museum of Health and Medicine, National Institute of Child Health and Human Development or Louisiana State University Health Sciences Center. The opinions expressed herein represent those of the author and not the Department of Defense or its components, the National Museum of Health and Medicine, National Institute of Child Health and Human Development or Louisiana State University Health Sciences Center.

History

The Carnegie Collection of Embryology's primary focus is on normal development in the first eight weeks. Collateral materials include photographs, plaster and acetate models, reprints and curatorial information. Far from sitting on some shelf gathering dust, the collection is very much in use and in demand. It forms the centerpiece of the National Museum of Health and Medicine's Human Developmental Anatomy Center (HDAC). Scientists have generated a database system for easy access to embryos in the collection. These embryos represent the full range of embryonic growth from single cells through eight weeks. The original HDAC website was designed and created with help from National Library of Medicine staff. An early interagency transfer from NICHD, NCCR and NLM began a project to digitize embryos, create 3-D models and create a web site to provide information and resources for K-12 and college students studying embryology. From its small beginnings the site has grown to include many resources for the student of embryology including biographies of famous researchers and the Carnegie Collection of Embryology, lab manuals of developmental anatomy, and a showcase for student projects.

The Eunice Kennedy Shriver National Institute of Child Health & Human Development has provided support for two components of the imaging project. NICHD funded the nascent HDAC to image and create models of the embryos for its early website. Also funded by NICHD is "Human Embryo Sections on DVD's for Education" (DREM), an educational product created by Louisiana State University Health Sciences Center (LSUHSC) to provide students, educators and researchers accurate, inexpensive, and accessible visual information on human embryonic development. Aligned digital images of the serial sections of the best, normal human embryos in the Carnegie Collection are labeled, and internal and external structures modeled. This highly useful tool is available on DVD or the DREM website, and now via iPhone application giving tactile functionality to existing 3D embryo data.

The new app will enable students to learn human embryology from images of actual embryos, provide a valuable reference for developmental biologists, and is a resource for the general public wishing for more information about a progressing pregnancy. Scientists and educators have used the Carnegie Collection of Embryology housed at the National Museum of Health and Medicine to define normal human embryo development for decades. A database, called the Virtual Human Embryo, has been created to provide digital serial sections of human embryos from the collection.

Method

The Embryo App uses mobile telecommunication and multimedia technologies to add interactive capabilities to the digital information, enhancing our understanding of embryo development. This App is part of the National Library of Medicine's (NLM's) program to fulfill its role as a provider of medical, scientific, and healthcare information using mobile technologies. LSU has supported the 3D reconstruction of the collection to add visual dynamics to the images. The mobile app was programmed using the Xcode 4 and iOS SDK 4.3 for design and development. Compatible with iPhone, iPod Touch and iPad, it requires iOS 3.0 and later. The application was launched March 8, 2011.

Embryo App Features

The Embryo App is available free of charge and is compatible with iPhone, iPad, and iPod Touch. It includes the following features:

- Movies (with accompanying audio) on fertilization and in vitro fertilization
- A pregnancy and ovulation calculator
- A lab manual including: 2D photographs, 3D reconstructions, 3D animations, structure reference labels, and information for each of the early stages (1 through 23) of embryonic development.
- Links to social networks and to extended resources from the National Library of Medicine, LSUHSC, and other institutions.



Features at a glance:

- Digital images of the early stages both in 2 D and 3 D reconstructions
- Pregnancy calculator
- Related resources

This mobile app demonstrates that grant products from a variety of sources can be repurposed to a new platform of information-sharing which the mobile apps facilitate. To create this app a collaboration had to be established in order to obtain a collection of images and videos that would show fertilization and development, all of which had to be in the public domain, and format those images for the iPhone, and other mobile devices. In its new, digitized form, the Carnegie Collection of Embryology continues to serve science and tell us marvelous things about ourselves unborn. At the time this poster was written, there were over 2000 downloads.

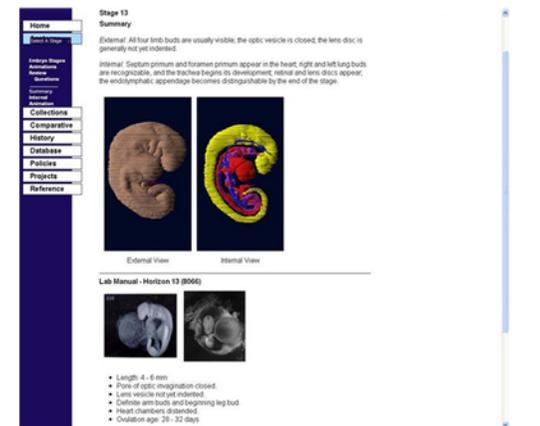
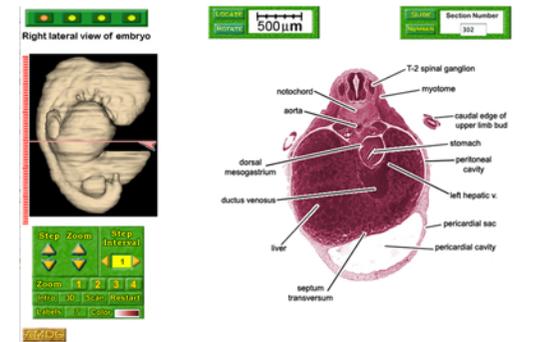
The Embryo App provides the images and information that have been available on the NMHM website now in a portable, accessible, and interactive format. The NMHM website currently delivers a manual of embryology that receives traffic, mostly from educational organizations. In collaboration with LSU, NMHM sought to provide accurate, inexpensive, and accessible visual information on human embryonic development. The Embryo App allows for expansion of the user base and improves accessibility to existing users. The mobile device gives a tactile functionality to existing 3D embryo data.

Uses of the Embryo App

Students, scientists, museum educators, and the general public can access the Embryo App for use in classrooms, the Embryo App has expanded the educational and outreach capabilities of NMHM. Docents use the Embryo App for the iPad to supplement tours of an embryology exhibit, and use it to direct visitors to more information on human development. During the Museum's relocation to a new facility this summer, the Embryo App will be a tool for outreach programming, supplying a visual, interactive information source.

Future Additions

The Embryo App's functionality will be expanded to suit user needs. Expected additions include user-manipulated models, side swipe features, and internal links to or inclusion of stacks of histological sections for each developmental stage, complete with labels.



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Project: "Human Embryo Sections on DVD for Education"
 Recipients: Louisiana State University Health Sciences Center and NMHM/AFIP
 Funding: National Institute of Child Health and Human Development, National Center for Research Resources, 1999-2011

Project: "Human Embryology Digital Library and Support Tools"
 Recipients: George Mason University and NMHM/AFIP, San Diego Super Computing Center, Lawrence Livermore National Laboratory, John's Hopkins Medical School, Eolas Inc.
 Funding: National Library of Medicine Next Generation Internet Grant, 1999-2002

Project: "Three-Dimensional Reconstruction of the Human Embryo"
 Recipients: National Museum of Health and Medicine/Armed Forces Institute of Pathology(AFIP)
 Funding: National Institute of Child Health and Human Development,
 National Center for Research Resources, 1994-1999

Download at <http://itunes.apple.com/us/app/embryo/id422337604?mt=8>