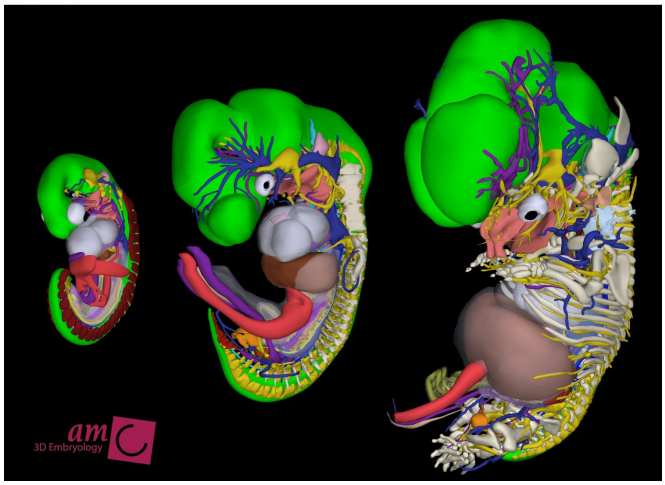
New atlas depicts first two months of human development in 3-D

25 November 2016, by Bob Yirka



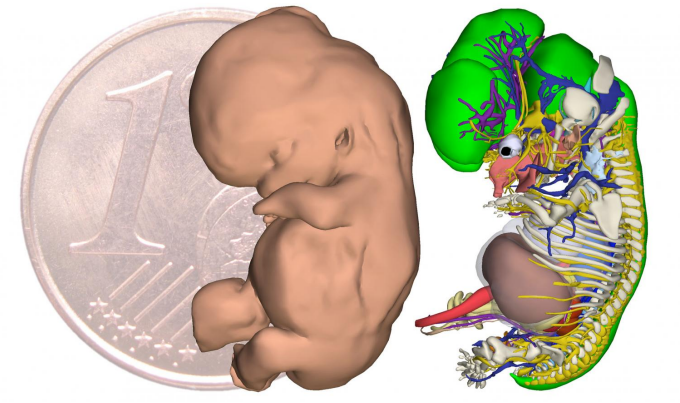
3D reconstructions of human embryos at (from left to right) 6, 8 and 9.5 pregnancy weeks. Credit: Bernadette de Bakker, MD of the Academic Medical Center in Amsterdam, The Netherlands

(Medical Xpress)—A team of researchers at the Academic Medical Center in Amsterdam, the Netherlands has created an updated interactive 3-D atlas that depicts the various stages of human development from conception to two months. In their paper published in the journal *Science*, the researchers outline the reasons for medical texts being outdated, how they got around the problem, the features of the new atlas and what it might mean for future medical research efforts.

In their paper the researchers note that modern medical textbooks offer prospective doctors imagery of the first months of human conception that are wildly out of date—pictures and diagrams are from work done half a century ago or longer. Some are from the early 1900's. Some of the illustrations have even been made by artists attempting to apply what can be seen in the early development of other animals, such as mice, to human development. This unfortunate state is due to restrictions placed on the study of developing humans, both those that are still living and growing and those that have died. To provide both researchers and physicians a better reference tool the researchers scanned approximately 15,000 images from the Carnegie Collection of embryo imagery and used them create a new updated 3-D atlas. The work involved analyzing the images and comparing them against one another to form a consensus regarding elements such as organ size and location as they appear over the course of multiple landmark development dates.

The result is a virtual atlas reminiscent of Zygote Body (originally developed by Google). Users can choose a stage, which indicates an age, e.g. 51 to 53 days after conception and then manipulate the image that is displayed to suit their needs by zooming in, comparing size relative to a grown human hand or peeling back layers to view induvial organs, or the nervous or circulatory system.

The researchers report that their work, which included assistance from approximately 75 students, revealed that some of the images in current textbooks have organs in the wrong place while others have them developing in the wrong time frame. The new atlas, they claim, should prove to be helpful to researchers looking to better understand birth defects, particularly those that get their start very early on. It should also provide doctors with better information regarding development in pregnant women.



3D reconstructions of a human embryo at 9.5 pregnancy weeks (15.9 mm in length). On the left the skin, on the right all reconstructed organs. Credit: Bernadette de Bakker, MD of the Academic Medical Center in Amsterdam, The Netherlands

More information: B. S. de Bakker et al. An interactive three-dimensional digital atlas and quantitative database of human development, *Science* (2016). DOI: 10.1126/science.aag0053

Abstract
Current knowledge about human development is based on the description of a limited number of embryonic specimens published in original articles and textbooks, often more than 100 years ago. It is exceedingly difficult to verify this knowledge, given the restricted availability of human embryos. We created a three-dimensional digital atlas and database spanning the first 2 months of human development, based on analysis of nearly 15,000 histological sections of the renowned Carnegie Collection of human embryonic specimens. We identified and labeled up to 150 organs and structures per specimen and made three-dimensional models to quantify growth, establish changes in the position of organs, and clarify current ambiguities. The atlas provides an educational and reference resource for studies on early human development, growth, and congenital malformations.

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