# The simple truth: Animal development not as complicated as it seems

January 13 2005

Shedding light upon evolution, a University of Houston professor studying cell lineages now finds surprising simplicity in the logic of animal development.
Ricardo Azevedo, an assistant professor in the department of biology and biochemistry, specializes in how evolution changes the way animals develop. His recent findings using computational biology to reveal the surprisingly simple patterns of cell division in the embryos of small invertebrates is described in a paper titled "The Simplicity of Metazoan Cell Lineages," appearing in the current issue of Nature, the weekly scientific journal for biological and physical sciences research.

"The significance of my findings is that these cell lineages are not as complicated as many scientists have thus far believed," Azevedo said. "Our hope is that our approach of treating development as a computer program will help developmental biologists to analyze their favorite organisms."

Since we now understand much about how genes evolve, the attention of biologists like Azevedo has shifted toward elucidating the evolution of developmental mechanisms in the hope of unraveling how evolution modifies more complicated and, therefore, more interesting traits like body size, aging or behavior.

Azevedo and his colleagues constructed an algorithm to contrast the developmental complexity of different organisms based on their sequences of cell divisions, known in the trade as cell lineages. They

compared the known cell lineages of three different nematode worms and a sea squirt with those randomly generated by a computer program. They found that the real embryos did not behave like the computer-generated ones, but instead showed that these organisms took fewer "different steps" to fully mature than predicted by chance. In other words, the development of these animals is simpler than it looks.

"It's particularly noteworthy that all four organisms showed the same pattern," Azevedo said. "The sea squirt, a chordate, has a general body plan similar – albeit simplified – to that of humans, while the nematode worms are more distant relatives of ours. Yet, they have all evolved toward a similar level of developmental complexity."

This type of consistency, says Azevedo, may not only impact developmental biology, but also medicine. With humans being made up of trillions of cells, cell lineage analysis has been slower to catch on when compared to the study of the large groups of cells we call organs, such as the liver and the brain. However, research into cancer and stem cells has focused our interest on the behavior of individual cells. The hope is that cell lineage analysis will become more important in the future.

Source: University of Houston