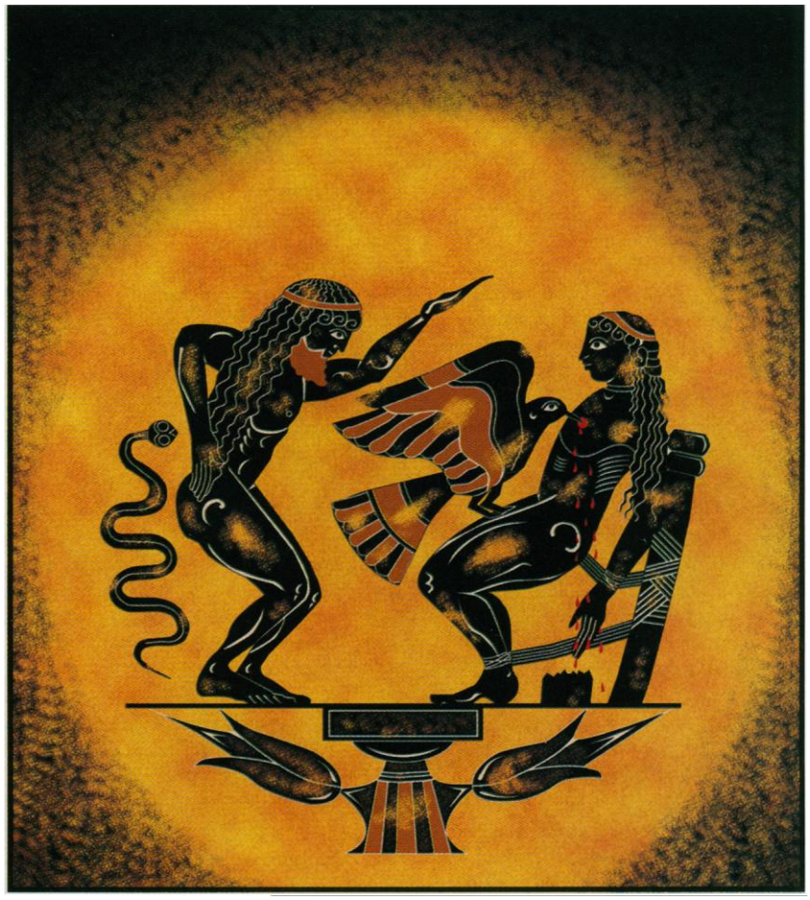
SCIENCE
Frontiers in Medicine: Regeneration

TABLE OF CONTENTS



The process of regeneration has been recognized since ancient times. Today we know that animals show a wide range in their ability to regenerate specific tissues and structures. A frequent subject for school science projects, the flatworm *Planaria* can regenerate entire body structures in either direction, toward head or tail. Animals higher up the evolutionary scale tend to be more limited in their regenerative capabilities. This special issue reviews recent insights into regeneration in vertebrates. As described by Michalopoulos and DeFrances and reflected in the cover image illustrating the myth of Prometheus, the mammalian liver shows a remarkable ability to regenerate just enough functioning liver tissue to replace the quantity of liver tissue removed. The liver cells do this with only limited dedifferentiation. Other tissues, such as bone and nervous tissue, make use of stem cells sprinkled throughout the tissue. These stem cells usually remain in an undifferentiated, quiescent state, but when called upon can proliferate to produce daughter cells that will differentiate into the required tissues. McKay describes the stem cells of the central nervous system and discusses how their action in the adult recapitulates some of the processes of early development. Prockop discusses how the bone marrow, known for its ability to provide a continuous supply of new blood cells, also contains stem cells that can differentiate into a wide range of other tissues. The healing of wounded skin, as discussed by Martin, uses a repair process that results in scarring in the adult but in reconstruction of normal skin in embryos. Brockes describes the unusual case of amphibian limb regeneration, in which all the missing tissues are replaced and reconstructed into a new functional limb. See also the news story on page 35 discussing a potential therapy that might limit the destruction caused by muscular dystrophy. And finally, in the editorial, Stocum discusses how these insights into the basic biology of development and regeneration may lead in the future to improved tissue repair as well as engineering of replacement tissues. For further information and recent related news stories, *Science* Online subscribers can visit the *Science* home page at http://www.sciencemag.org/.

–Pamela J. Hines