Cover illustration
Stem cells and their niche, along with differentiating germ cells, in the gonad of *Caenorhabditis elegans*. (Courtesy of J. Kimble.)

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STEM CELLS

More than 30 years ago, neurologist Oliver Sacks wrote of the Parkinson's drug L-dopa: "It is impossible to avoid the feeling that here, over and above all legitimate enthusiasms, there is this special enthusiasm, this mysticism, of a magical sort."

It is striking how aptly these words describe the current enchantment with stem cells. Now, 25 years after scientists first isolated mouse embryonic stem cells, it is possible to isolate and culture stem cells from embryos and adult tissues of many species, including humans. They are genetically no different from other cells in the body, so what combination of molecules confers their unique ability to self-renew and produce copious amounts of new cells, while maintaining the potential to form cell types of many lineages?

The identity of these molecules remains elusive, but, as the wellspring of growth, regeneration and healing, they are unlikely to remain hidden for long. And understanding their mechanisms may well transform medicine by enabling patient-specific therapies, in which a patient's adult somatic cells are reprogrammed to form genetically and immunologically matched stem cells. Such advances might one day make the use of human oocytes and embryos in stem-cell research a thing of the past. For the foreseeable future, however, the judicious use of human embryos and oocytes will be necessary for the very advances that will eventually make their use in stem-cell research obsolete.

Molecular reprogramming is just one facet of a field that is defined by its creative and interdisciplinary approach, as is embodied by the reviews in this Insight. No need for magical thinking here — the science is fascinating and superb. We hope these reviews convey some of the legitimate enthusiasm of stem-cell biology — well-tempered with reality.

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Natalie DeWitt, Senior Editor

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