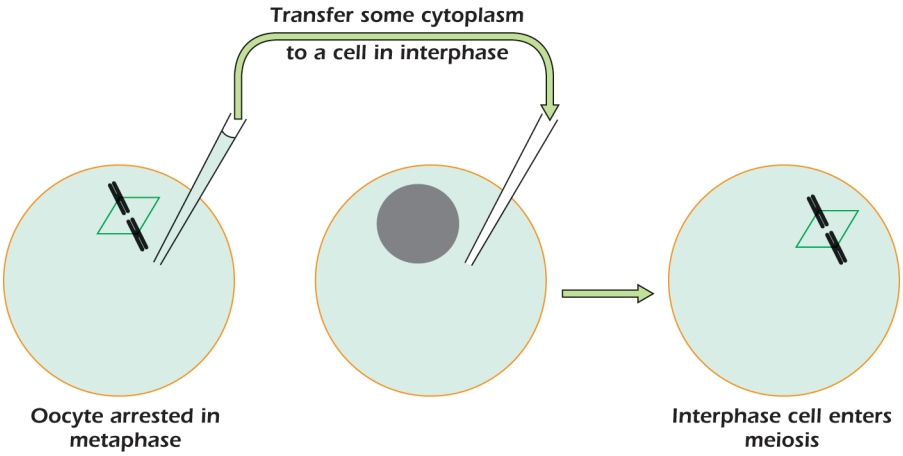
Chapter 18

Web Text Box 2

A factor in dividing cells triggers mitosis in interphase cells



In 1971 Yoshio Masui published one of the first papers that led to our present understanding of how the cell cycle is controlled (Masui and Markert, 1971, J Exp Zool 177 p129). Frog oocytes develop by the process of meiosis that we illustrate in Figure 18.4 on book page 301, but arrest and wait at metaphase II, with the chromosomes lined up on the spindle. Only when the egg is fertilized does meiosis proceed to completion. Masui discovered that if cytoplasm from an oocyte in metaphase II was sucked out and injected into an oocyte that has not yet begun to enter meiosis, that second oocyte initiated meiosis. He hypothesized that there was a factor in the cytoplasm of meiotic oocytes that stimulated meiosis in interphase oocytes. Later experiments showed that the same effect could be observed with mitotic cells, and the cytoplasmic factor, which had originally been termed MPF for maturation promoting factor, was renamed M-phase promoting factor. Many years of work were necessary before MPF was purified and its chemical nature determined. MPF consists of just two proteins - active, dephosphorylated CDK1 bound to cyclin B (Figure 18.8 on book page 306).

Paul Nurse's 2001 Nobel lecture gives a historical overview of the many decades of research on cell cycle control.