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1. Lundberg, K.S., et al. (1991) Gene 108: 1-6

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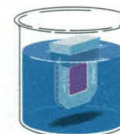
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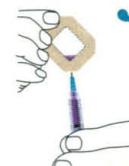
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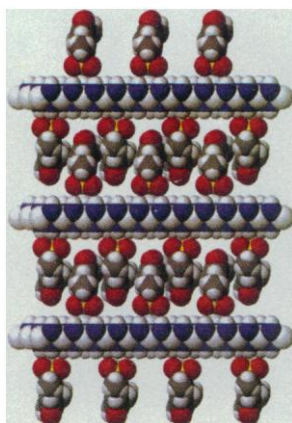
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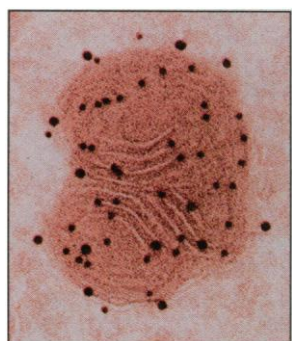
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Organic images



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DM Localization

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COVER

Scanning electron micrograph of invasive human trophoblasts in vitro. In early pregnancy, fetal cells of the placenta (trophoblasts) invade the uterus. They replicate this behavior in vitro by invading matrix-coated filters; pseudopodia pass through pores and appear on the filter's underside (shown in photo). Trophoblast

invasion is regulated by cell adhesion molecules and proteinases and is essential for normal embryonic development. See page 1508 and related Articles, Reports, and News stories in this special issue on reproduction. [Photo: Clifford Librach and Susan Fisher]



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Isle Royale food chain



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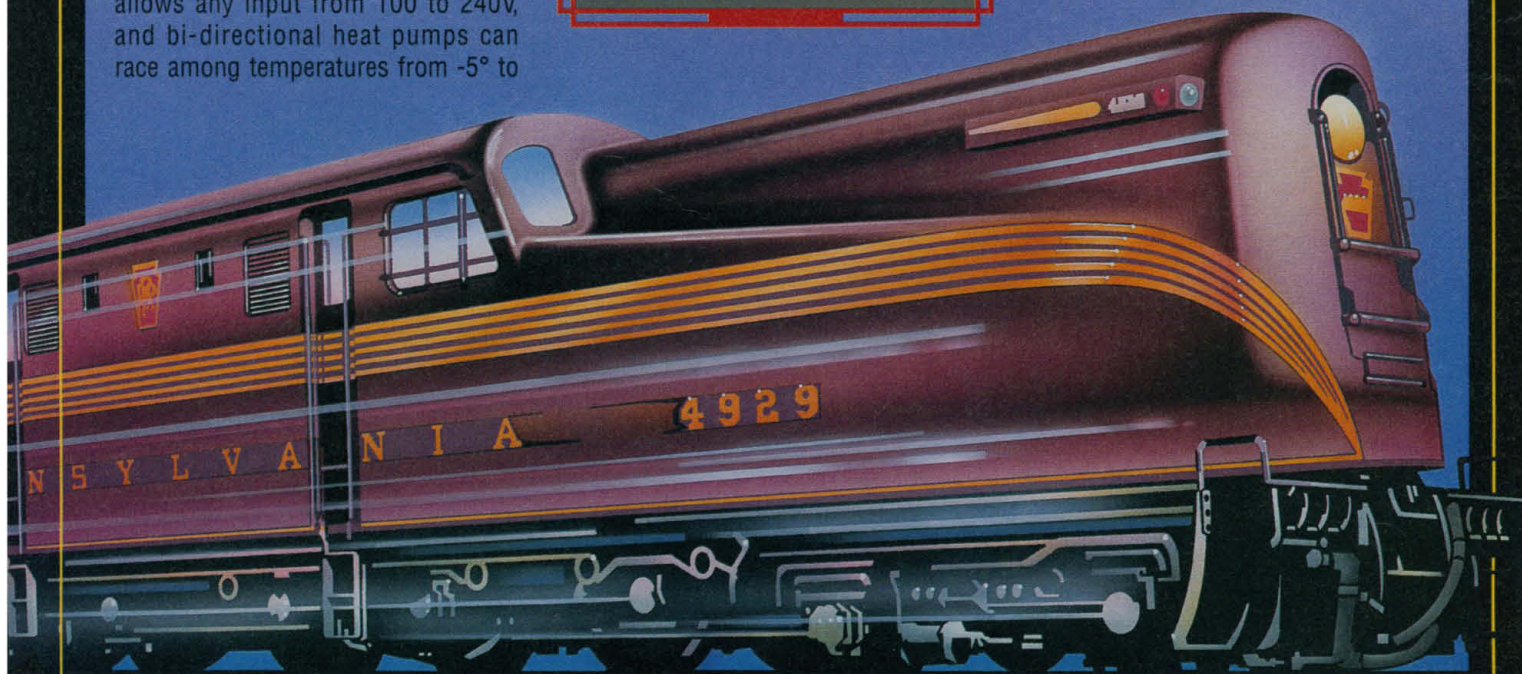
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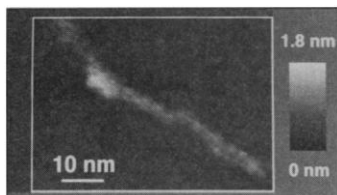


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The polymerase chain reaction (PCR) is a process covered by patents owned by Hoffmann-La Roche. Users should obtain proper license—or use licensed reagents—to perform the reaction.

Skimming the waters

Scanning tunneling microscopes (STMs) are normally used to image conductors and semiconductors. However, insulating materials, such as most organic molecules, must be spread as very thin films (less than 1 nanometer thick) over



conducting substrates or else coated with metallic overlayers, which degrade resolution, if they are to be imaged with the STM. Guckenberger *et al.* (p. 1538) show that insulating substrates, such as mica, can be imaged with the STM when a molecular film of water (roughly a monolayer) is present on the surface. This approach was used to image uncoated plasmid DNA adsorbed on mica.

Terminations two

Constructing devices from oxides that have a perovskite structure, such as the high-temperature superconductors, requires controlling the atomic layer that is exposed to the surface. For example, SrTiO_3 has a perovskite structure, and its (100) surface ideally could terminate as an SrO layer or a TiO_2 layer. Most surface preparations tend to produce a rough surface that mixes these terminations. Kawasaki *et al.* (p. 1540) show that atomically smooth SrTiO_3 surfaces could be terminated in the TiO_2 plane by carefully etching the surface with a buffered solution of NH_4F -HF and that the SrO termination could be obtained by homoepitaxial growth. Such films can serve as

Making the cut in Hedgehog proteins

Proteins of the *hedgehog* gene family are involved in signal transduction pathways used in pattern formation during development. Originally found to be required for proper polarity within segments of the *Drosophila* embryo, *hedgehog* also functions in the patterning of the adult tissue precursors. In vertebrates, members of the *hedgehog* gene family are required to pattern the nervous system and the limb. Lee *et al.* (p. 1528; see the Perspective by Peifer, p. 1492) have explored the biology and biochemistry of the Hedgehog protein. They find that the *Drosophila* Hedgehog protein is internally cleaved to form two major protein species by autoproteolysis. They demonstrate that this cleavage is necessary for proper functioning of Hedgehog in vivo. The two predominant protein species have distinct biochemical properties and localization within the embryo. Such distinct features may account for the involvement of Hedgehog long- and short-range signaling roles during development.

substrates for the controlled growth of films of the superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{7.8}$.

Miscibility gap

Olivine, with a composition of $(\text{Mg,Fe})_2\text{SiO}_4$, is a dominant mineral in Earth's upper mantle and many meteorites. It has typically been thought to show continuous solid solution of iron and magnesium. Pateav and Brearley (p. 1545), however, describe iron-rich and magnesium-rich lamella in olivine in the Divnoe meteorite that imply that exsolution occurred during cooling. The implied temperature of the crest of the solvus is at least 150°C and perhaps as high as 450°C .

From the top down

Evidence that some food chains function with top-down control currently exists for some aquatic organisms. In a top-down model (trophic cascade), changes in density at one trophic level are caused by opposite changes in the next higher trophic level, and such changes cascade down

the food chain. McLaren and Peterson (p. 1555) find evidence that such an interaction exists among the wolves, moose, and balsam fir trees on Isle Royale, Michigan. The balsam fir trees displayed cycles of tree ring growth that reflected the density of moose. The density of moose was determined by the effects of wolf predation.

Loading zone

Peptide antigens that are seen by T cells are bound inside the presenting cell to major histocompatibility complex (MHC) molecules, which then migrate to the cell surface. The unusual MHC class II molecule, DM, is essential for peptide binding to "normal" class II proteins. Sanderson *et al.* (p. 1566) show that DM is rarely part of the MHC class II complex expressed at the cell surface but instead is localized to multilaminar compartments called MIIC, where class II molecules associate within the cell. Karlsson *et al.* (p. 1569) show that a cell type that does not normally present antigen (HeLa cells) can load peptides onto MHC class II

molecules after transfecting class II molecules, invariant chain, and H-2M, the murine equivalent of DM.

IRS cross talk

Growth factor receptors and extracellular matrix receptors (integrins) can exhibit functional synergy, so it has been suspected that their signaling pathways would overlap. Vuori and Ruoslahti (p. 1576) show that in the case of insulin receptor signaling, this critical "cross talk" may occur through insulin receptor substrate-1 (IRS-1), a major target protein phosphorylated by the insulin receptor. The IRS-1 protein was shown to bind to $\alpha_v\beta_3$ integrin in insulin-stimulated cells, and this binding was accompanied by stimulated DNA synthesis.

Winning entry

Fertilization of various animal eggs requires that the corresponding sperm first undergo an exocytotic reaction (acrosome reaction), which results in the release of lytic enzymes and exposure of specific receptors. In mammals, the acrosome reaction can be induced by the zona pellucida, a coating of the egg, or by progesterone entrapped in the cumulus oophorus, the layer of maternal cells surrounding the egg and zona pellucida. By analyzing the signal transduction cascade, Roldan *et al.* (p. 1578) show that when progesterone is presented before the zona pellucida, the progesterone seems to prime the sperm for a greater response to the zona pellucida signal that follows. This order of signals mimics the order in which the sperm encounters these signals in natural fertilization.

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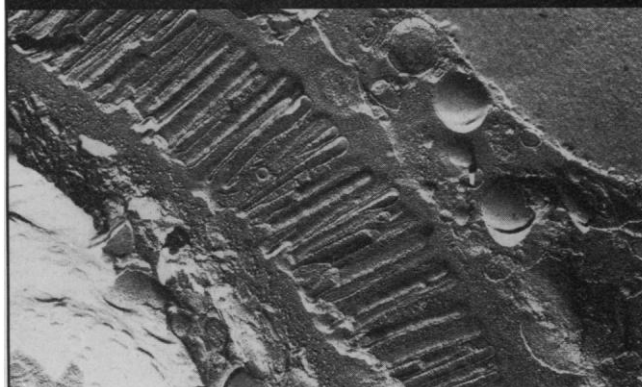
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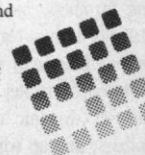
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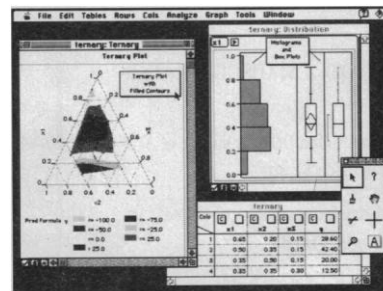
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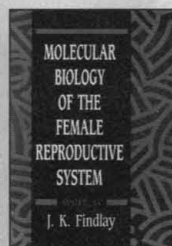
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