through servers maintained by various universities, the U.S. and foreign governments, and even by business competitors. Moreover, the sender of e-mail should appreciate that the message is vulnerable to interception during transmission through Internet by sniffer programs that can copy text containing key words.

When one considers these risks of disclosure, it is not surprising that an e-mail message is often compared to a postcard. Many would argue, however, that the privacy associated with e-mail is actually much lower than that provided by a postcard.

Accordingly, there is a risk that the contents of an e-mail message will be transmitted to an unintended party or even enter the public domain. In this way, a message that either disseminates preliminary research results that, in effect, describe an invention, or communicates an invention disclosure can jeopardize patent rights to the invention (*1*).

If an e-mail message is a postcard, then encryption is the envelope that shields the message from unintended viewers. E-mail encryption provides control over the distribution of information and offers the level of confidentiality that hard-earned research discoveries merit.

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The Nuclear Option

In his thoughtful and informative essay on tradeoffs between economic development and environmental damage in less-developed countries (LDCs) (Policy Forum, 25 Aug., p. 1058), José Goldemberg poses a classic *Catch 22* problem. By any projected current scenario to achieve economic growth adequate to sustain political stability, energy development will inevitably expand the global emissions of greenhouse gases and produce other deleterious side effects on the environment. Without economic development, however, population stability is unattainable, and population growth will operate to exacerbate environmental impacts.

Although he concludes that "all sources of energy will be needed, despite energy conservation efforts," Goldemberg does not discuss the nuclear option, which by common consent is no longer regarded as viable. Environmentalists will tell you that it is inherently much too dangerous, and resource economists will tell you that it is also too expensive in a world where the real prices of fossil fuels, in constant dollars, have been falling steadily for several years.

Every activity, however, has its costs and all life is risky: The antinuclear philosophy, which underpins much of the present consensus against nuclear energy, was forged at a time when only a few atmospheric scientists appreciated the threat of greenhouse warming from the burning of fossil fuels and before the links between economic development and population stability were well documented.

Nuclear power is no panacea, and cannot replace liquid hydrocarbons as a cheap transportation fuel, but it can surely generate almost arbitrarily large amounts of electricity without any release of greenhouse gases. The fact that France already produces more than half of its electricity from nuclear power makes that case better than any theoretical arguments could. It is also, through breeder technology, in principle the only energy source that can produce more fuel than it consumes.

Given those considerations, it seems whimsical not to evaluate the potential role of nuclear energy in the future global energy equation. In the present public climate of almost religious fervor against nuclear power plants, there seems little chance that dispassionate analysis will be undertaken except within the scientific community. We have a responsibility, as always, to review such issues without regard to current political trends.

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Intrachain Calcium Binding

In the introduction of their article about vitamin K and energy transduction, Paul Dowd *et al.* (22 Sept., p. 1684) discuss the role of γ-carboxyglutamic acid (Gla) in serine proteases involved in blood coagulation. They outline a mechanism whereby Ca^{2+} ions anchor the proteins to cell membranes by means of ion bridges involving Gla side chains on the proteins and negatively charged phosphate head groups on the phospholipid membrane surface, a hypothesis that has been favored for a long time.

Recent studies have cast new light on the mode of interaction of Gla-containing proteins with biological membranes. We have found (*1*) the side chains of the Gla residues to be exposed on the surface of the protein and a cluster of three hydrophobic amino acids in the interior of the protein (*2*). Upon Ca^{2+} binding, the Gla residues fold into the core of the domain where they ligate Ca^{2+} ions in a cooperative manner. This leads to the exposure of the hydrophobic amino acids (Phe[4], Leu[5], and Val[8] on bovine factor X) that in the Ca^{2+}-free form are "hidden" in the interior of the Gla domain (*3*). These experiments, as well as other pieces of evidence, makes it seem likely that the reversible interaction of Gla-containing coagulation factors entails a significant component of hydrophobic interactions.

The role of Ca^{2+} in epidermal growth factor (EGF) domain–containing coagulation factors is even more complex, as a single Ca^{2+} ion, bound with five ligands from the EGF domain and one or two from an adjacent Gla domain, orients the Gla and EGF domains relative to each other in a manner commensurable with biological activity.

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Letters to the Editor

Letters may be submitted by e-mail (at science_letters@aaas.org), fax (202-289-7562), or regular mail (*Science*, 1333 H Street, NW, Washington, DC 20005). Letters will not be routinely acknowledged. Full addresses, signatures, and daytime phone numbers should be included. Letters should be brief (300 words or less) and may be edited for reasons of clarity or space. Beginning in October 1995, our previous policy of consulting with all letter authors before publication will be discontinued.