LETTERS

EDITORIAL
Evolving Patterns of Energy Production and Use

ARTICLES
Metal Oxide Chemistry in Solution: Early Transition Metal Polyoxoanions: V. W. Day and W. G. Klemperer
Bond Order and Charge Localization in Nucleoside Phosphorothioates: P. A. Frey and R. D. Sammons
Crystallographic Structure of the Octameric Histone Core of the Nucleosome at a Resolution of 3.3 Å: R. W. Burlingame et al.
Insertion Mutagenesis of Embryonal Carcinoma Cells by Retroviruses: W. King et al.

NEWS AND COMMENT
China Plans Sweeping Reforms in Science
Gene Therapy Guidelines Revised
Shuttle Encounters Landing Trouble
In Defense of “Star Wars”

Briefing: New Biotechnology Research Program in Britain; House Opens Broad Science Policy Hearings; Baby Doe Regs Set; Panel Examines Costs of Nuclear Warheads; Utilities Look to New Coal Combustion Technology

Court Gives CIA Broad Secrecy Rights

RESEARCH NEWS
Gregarious Grazers Eat Better
NSF Commits to Supercomputer
Molecular Clocks Scrutinized

BOOK REVIEWS
Quantum Theory of Gravity, reviewed by R. D. Sorkin; Atmospheric
Disturbance and Ecologic Succession in an Upper Ordovician Cobble-Dwelling Hardground Fauna: M. A. Wilson

Expression of a Microinjected Porcine Class I Major Histocompatibility Complex Gene in Transgenic Mice: W. I. Freis et al.

Location of Gene for β Subunit of Human T-Cell Receptor at Band 7q35, a Region Prone to Rearrangements in T Cells: M. Isobe et al.

Genes for β Chain of Human T-Cell Antigen Receptor Map to Regions of Chromosomal Rearrangement in T Cells: C. C. Morton et al.


Epizootic Carcinoma in the Winter Flounder, Pseudopleuronectes americanus: R. A. Murchelano and R. E. Wolke

Comparative Toxicology of Loxosceles reclusa and Corynebacterium pseudotuberculosis: A. W. Bernheimer, B. J. Campbell, L. J. Forrester

Ethanol Neurotoxicity: Effects on Neurite Formation and Neurotrophic Factor Production in Vitro: K. E. Dow and R. J. Riopelle

Characterization of Envelope and Core Structural Gene Products of HTLV-III with Sera from AIDS Patients: W. G. Robey et al.

Detection of a Cellular Oncogene in Spontaneous Liver Tumors of B6C3F1 Mice: T. R. Fox and P. G. Watanabe

Brain Dopamine and Serotonin Receptor Sites Revealed by Digital Subtraction Autoradiography: C. A. Altar et al.

Regenerating Fish Optic Nerves and a Regeneration-Like Response in Injured Optic Nerves of Adult Rabbits: M. Schwartz et al.

Habitat Selection in a Clonal Plant: A. G. Saltzman

Amygdalectomy Impairs Crossmodal Association Monkeys: E. A. Murray and M. Mishkin

Methionine and Leucine Enkephalin in Rat Neurohypophysis: Different Responses to Osmotic Stimuli and T2 Toxin: N. Zamir et al.

Color-coded image of dopamine (D2) and serotonin (S2) receptors in brain. These receptors are revealed by the binding of [3H]spiroperidol to a thin horizontal slice of rat brain. An autoradiograph results from exposing the brain slice to tritium-sensitive film. Differing gray tones of the developed film are color-coded, whereby increasing amounts of [3H]spiroperidol binding are represented by black, blue, green, yellow, and red. [3H]spiroperidol principally labels S2 receptors in the neocortex and D2 receptors in the striatum. See page 597. [Photograph prepared using the image analysis facility of the LASER Microbeam Program, University of California, Irvine. Image preparation and photography by J. N. Joyce]
Evolving Patterns of Energy Production and Use

Many factors have combined to make profound changes in the energy picture. One consequence of the interplay of factors has been to decrease the vulnerability of the United States to an interruption of petroleum supplies. Imports of petroleum and its products into the United States are now about half of what they were in 1978. Another development has been a lessening in the ability of OPEC to control the prices of oil. Still another consequence is to place a lid on the cost of all forms of energy and hence a restraining force on inflation.

Factors contributing to these changes include a substantial increase in the efficiency of energy use which, coupled with conservation practices, has decreased demand for petroleum products. The trend toward improved efficiency of energy use continues and is likely to continue. Another development has been the installation of large numbers of oil-refining units capable of producing excellent yields of high-value products from heavy crude oils. This has enhanced the value and marketability of heavy crudes. Another development has been increasing discoveries and production of oil by countries outside OPEC, including Brazil, Colombia, Egypt, India, Mexico, Norway, Pakistan, Peru, and the United Kingdom. Another factor in easing the demand for oil has been the substitution of other energy sources such as natural gas, coal, and nuclear.

The enhanced value and marketability of heavy crudes is fostering increased production of them and is diminishing the premium paid for light, sweet crudes. The amount of crude oil required to produce a given quantity of refined products has decreased. Substantial production of petrochemicals is coming on stream in Saudi Arabia. This will result in diminished production of them in the United States, thereby lessening somewhat consumption of natural gas and crude petroleum here. Powerful computerized geophysical techniques are being applied to improve reservoir engineering. This in turn is also leading to enhanced oil recovery from known fields through use of such procedures as CO₂ and steam injection.

In the United States the discovery rate for natural gas has improved from what it was in the 1970’s. At that time about twice as much was consumed each year as was found. In recent years additions to reserves have nearly balanced production. The present abundance of producible gas has led to a lowering of prices and competition for oil for use as a heat source. In turn, natural gas in encountering determined competition from electric power for industrial, commercial, and residential markets. One response by the gas industry has been to develop more efficient appliances so that gas can compete better with electricity. For example, the thermal efficiency of one line of burners for new home heaters has been increased from about 60 to 90 percent.

At present the use of coal as an energy source is the subject of environmental concerns about acid rain. But the lower cost per Btu and development of improved means of reducing sulfur emissions guarantee expansion of the use of coal. Fluidized bed combustion and gasification to produce clean intermediate-Btu gas are destined to have substantial future applications. Industrial use of fluidized beds has been expanding. High-ash, high-sulfur coal can be burned, and emissions of sulfur oxides and nitrogen oxides can be limited to practically any desirable level.

An increasing share of the world’s electricity is being generated at nuclear power stations. Leaders in this development are the United States, France, and Japan. In France and Japan, the use of nuclear energy diminishes imports of corresponding amounts of oil. Special circumstances in the United States have led to a poor climate for nuclear energy, but its use continues to expand.

Inevitably, domestic supplies of oil will diminish, but if current trends of increased energy efficiency and of substitution are maintained, transition to the use of other energy sources will proceed relatively smoothly.

—PHILIP H. ABELSON