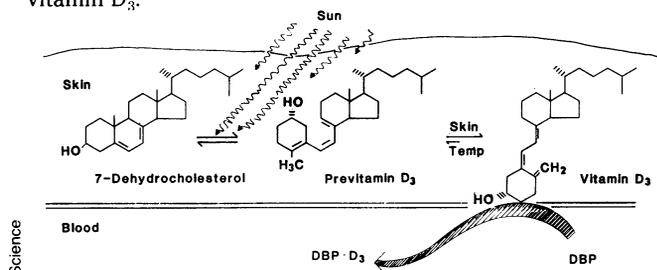


Between the sun and vitamin D

An important chemical middleman is involved in the manufacture of vitamin D₃ — vitamin D with cholesterol side chains.

When sunlight bombards the skin, the epidermal stores of the compound 7-dehydrocholesterol (7-DHC) are converted into previtamin D₃ (preD₃) — a compound with the same chemical components of vitamin D₃, but a different structural arrangement of those components. Michael F. Holick of Massachusetts General Hospital in Boston and colleagues, whose work is described in the Oct. 10 *SCIENCE*, observed this process in human leg skin. Robert M. Moriarty and colleagues of the University of Illinois in Chicago report in the June 4 *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY* observance of the same process in synthetic lipid multibilayers, models for epidermal photosynthesis.

Once formed in the skin, preD₃ undergoes a temperature-dependent rearrangement to form D₃, Holick and colleagues report. In warm-blooded animals, because of the closely regulated body temperature, this results in a slow, steady conversion of preD₃ to D₃: It takes, for example, 18 hours for 50 percent of the preD₃ formed during 1 hour of sunlight exposure to convert to vitamin D₃.



Vitamin D-binding protein (DBP) carries D₃ into the bloodstream.

Vitamin D, whether produced in the skin by sunlight or ingested, stimulates the intestines to absorb more calcium from the diet. The photosynthesis of a go-between in the formation of D₃ guards against vitamin D toxicity, characterized by soft tissue calcification and kidney stone formation.

The discovery of the preD₃ step has implications for treating patients with impaired vitamin D metabolism. In the liver and kidney, OH groups are added to vitamin D to activate it. Although oral administration of this active form has been effective in treating patients with vitamin D problems, it occasionally results in the release of too much calcium in the blood. In the Aug. 14 *NEW ENGLAND JOURNAL OF MEDICINE*, Holick and colleagues report that because preD₃ formation results in a slow, steady release of vitamin D₃, skin applications of 7-DHC, which converts to the preD₃ during sunlight exposure, may be useful in the treatment of patients with impaired vitamin D metabolism.

The status quo approach to CFC's

Although no longer used to propel deodorant and shaving cream spray, chlorofluorocarbons (CFC's) persist as refrigerants, blowing agents for insulating foams and industrial cleaning solvents. Now, the U.S. Environmental Protection Agency is considering a ceiling on such CFC use.

CFC's are a family of chemical compounds suspected of depleting stratospheric ozone — the atmospheric layer that shields the earth's surface from ultraviolet light that can cause skin cancer, decreased crop yields and adverse effects on the marine food chain (SN: 1/5/80, p. 5). EPA is considering its CFC ceiling "such that the potential for ozone depletion does not increase over present levels," according to the Oct. 7 *FEDERAL REGISTER*. The agency will review comments on the plan and may propose the rule next year.

OCTOBER 18, 1980

Computing by light

Just when engineers were predicting that size and cost reductions in computer technology were approaching their theoretical limit, a new concept in digital-computer design is surfacing to challenge them. Called the optical-digital computer, it will use light beams, prisms and lenses — not integrated circuits — to carry and process signals. Conceptual details were described this week in Chicago at the Optical Society of America meeting by the computer's developers — Stuart Collins of Ohio State University, M.T. Fatehi of the University of Technology in Teheran, Iran, and K.C. Wasmundt of the University of Denver.

Digital computers communicate with a two "letter" alphabet of zeros and ones. It's the pattern of these letters that makes up the words and mathematical messages that a computer processes. In the optical computer, the presence and absence of light corresponds to the two-letter alphabet.

Replacing conventional computer chips — with their integrated transistor circuitry — would be an optical spacial-light modulator. An amplifier, it uses a weak light signal to control a strong one. A complex sandwich of liquid-crystal layers, this light-valve of sorts — measuring perhaps two inches on a side — absorbs an incoming light signal; exiting from its opposite side is an intensified copy of that signal. To store information, the exit beam is routed via mirrors back to the input side of the modulator where it forms a closed loop of light. Once the loop is complete, the original signal can be removed and the data pattern will stay in a memory system.

Data-processing density is the computer's chief advantage: The typical modulator has 250,000 elements per square inch, each behaving like an independent optical transistor. As such, its designers claim that it offers a possible 2,500-fold reduction in processing-hardware size over conventional electrical-digital computers. What's more, since light can shine on any or all image elements at once, data can be processed in parallel, rather than serially as in electronic computers.

With component testing finished, the developers now plan to assemble a working computer, a task that may take five years.

Band compression: TV via phone lines

Transmitting color television signals has required more than 100 million bits of data per second to reconstruct an image — far more than conventional copper-wire telephone lines can handle. But researchers at Bell Telephone Laboratories have found a way to digitize television signals into only 1.5 million bits per second, vastly reducing the bandwidth needed for video imaging and opening inexpensive phone lines to color TV.

Realizing that only part of a picture usually varies from frame to frame, the Bell technique estimates object motion occurring in a scene. Intensity comparisons are then made between the original element in a first scene and its expected location in successive ones. Doing so cuts image-replenishment requirements between TV scans by a third or half over previous data-compression ploys. Since excessive motion can still cause image smearing, the technique looks better for video-conferencing applications — where cameras and their subjects move relatively little — than for broadcasting network TV shows.

Dogging underground oil leaks

Leaks in underground power cables, where lines are cooled by oil, could cause arcing and a community blackout. But at the Southwest Research Institute in San Antonio, Tex., dogs — shepherds and retrievers — are learning to successfully sniff out oil leaks and sit at the trouble spot. Line checks of cable-pressure drops alert trainers where to release their hired noses.

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