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Leonard A. Sagan
Department of Environmental Medicine, Palo Alto Medical Clinic, 300 Homer Avenue, Palo Alto, California 94301

Mercury Vapor Sources

I read with great interest Robert S. Foote’s report on mercury vapor concentrations in buildings (11 Aug. 1972, p. 513) a few days after I installed a new fiberglass air filter, which was laced with mercury, in my furnace. I would be interested to learn if similar filters were in use in the buildings that Foote tested, and what effect they may have had on his results. The use of mercury on air filters in central heating systems would seem to be an excellent means of distributing mercury vapor throughout the home.

Arthur S. Brooks
Center for Great Lakes Studies, University of Wisconsin, Milwaukee 53201

Foote found high concentrations of mercury vapor in three doctors’ examination rooms. He comments that mercury thermometers had been broken there in the past.

I wonder if a more likely source of the mercury vapor might be the mercury-containing sphygmomanometer used by most physicians. In this instrument one pumps air from a rubber bulb through a flat rubber bag which has been fastened tightly around the patient’s arm, and then through a rubber tube into a mercury reservoir. Air pressure forces mercury from the reservoir into a vertically positioned glass tube. At the end of the procedure a valve on the pumping bulb is opened, permitting the air in the system to rush out under pressure. In this manner, air containing mercury vapor could enter the room. Perhaps Foote would care to examine the mercury concentration in this effluvial air. If this is indeed a significant source, then thought should be given to redesigning these instruments.

Saran Jonas
Department of Neurology, New York University Medical Center, New York 10016

Concentrations of mercury in wood-paneled or unpainted homes, in which fiberglass filters (of unknown brands) were used in the furnaces, were very low. It appears that little mercury contamination is caused by the use of such filters.

Paint containing mercury compounds was probably the contributing factor in homes where high mercury concentrations were found.

Robert S. Foote
GeoSensors Inc., 9731 Denton Drive, Dallas, Texas 75220

A Decent, Hardworking Word

Why do you allow a pair of silt-stained brigands like Irving and Harington (“Upper Pleistocene radiocarbon-dated artefacts from the northern Yukon,” 26 Jan., p. 335) to arm themselves with bone awls and flint knives, sneak up behind a decent, hardworking word like “artifact,” and stab it in the “i”?

Even Webster’s Third, which sanctions everything from the Precambrian to the Aquarian, prefers the “i,” although it suggests that if we really are going to get our usage from layer d of fluvial and lacustrine basin-fill sediments, we could go all the way to “artefact.”

Frank Sartwell
1801 16th Street, NW, Washington, D.C. 20009

Although I am diffident about matching my pedantic talents against Sartwell’s, I draw encouragement from the knowledge that Harington and I do not stand alone in our position with respect to the proper (I do not insist that it is correct) spelling of artefact. It is the custom of members of the Society for American Archaeology to spell “artefact” with an “e,” for the very good reason that this would have been the spelling in Latin had the word been current when Latin was. Thus, also, “archaeology,” with an “ae” rather than the vulgar neologism spelled with an “e” alone.

It is a question of values, which those of us who labor in the traditions of antiquity perceive, perhaps, more clearly than do most of those who do not, and which in any case we steadfastly refuse to relinquish, even in these times of wholesale abandonment of values, standards, and even whole fields of scholarship (for example, etymology) for the racy, the new, and, let us hope, the short-lived fads so prevalent today.
The use of "i" is but one more example of cultural mutation, one that should be suppressed lest its deleterious effect spread to bring about, for example, "elphant" and "Sartwill."

W. N. IRVING
Department of Anthropology,
University of Toronto,
Toronto 181, Canada

The Dryden Papers

Over the past 22 months, the Milton S. Eisenhower Library of the Johns Hopkins University has been collecting and collating the papers of the late Hugh L. Dryden (1898-1965), who was aerodynamicist at the National Bureau of Standards from 1919 to 1947, director of the old National Advisory Committee for Aeronautics from 1947 to 1958, and deputy director of NASA from 1958 to 1965.

His papers have been located at Johns Hopkins at the request of Mrs. Dryden because Dryden received his Ph.D. in mathematics and physics from Johns Hopkins in 1919, when he was 20 years old.

The basic collection of Dryden papers is now complete. An archival system is ready to accommodate all other letters, memoranda, notes, reports, photographs, and other forms of documentation that directly relate to Dryden's life and times.

It is hoped that those friends and associates of Dryden who presently hold correspondence (and other relevant documentation) in their private files will donate these items to the Dryden collection. In cases in which the material may have intrinsic value to the donor, Xerox copies will be equally satisfactory.

Dryden's career cut across the lives of tens of thousands of persons in hundreds of different ways. In addition to documentation, the collection will also include what rarely gets put on paper. Anecdotes live only in the minds of mortal men, and when they die the anecdotes die with them. Those persons who have Dryden anecdotes to contribute are especially invited to send them in.

Those who wish to contribute their Dryden materials to the Hugh L. Dryden Papers should send their materials to the address below.

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HUMAN ECOLOGY AND SUSCEPTIBILITY TO THE CHEMICAL ENVIRONMENT (4th Ptg.) by Theron G. Randolph, The Swedish Covenant Hospital, Chicago. '72, 160 pp., 1 il., $7.50

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MAMMALS OF THE SEA: Biology and Medicine edited by Sam H. Ridgway, Naval Undersea Research and Development Center, San Diego. (12 Contributors) '72, 830 pp. (6 3/4 x 9 3/4), 434 il. (8 in full color), 43 tables, $45.00

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Members have been invited to submit proposals for the 1974 Annual Meeting in San Francisco, California, 24 February to 1 March 1974. This meeting initiates a new plan for molding AAAS annual meetings in the spring. Some general themes being considered are: science and technology around the Pacific, science and technology in western America, and looking toward the 1990's.

Some examples might be: ecology of the Pacific coastal zone, modern urban transportation in the light of BART, astronomy and astrophysics in western America, possible energy budgets of the United States by 1990, looking toward world systems management in the 1990's, and the large space telescope.

The proposal should consist of the symposium title, name and address of the arranger, a 300-word synopsis of the purpose and content of the symposium, a list of potential participants, and a brief description of the audience expected. It should be sent to Dr. Howard D. Greyber, AAAS Director of Meetings, 1515 Massachusetts Avenue, NW, Washington, D.C. 20005.

If, after review, a preliminary proposal is accepted, a detailed program will be required by 15 July and final program copy by 15 October. A strong response from the AAAS membership will help shape a stimulating, vigorous program worthy and representative of the world's most energetic and productive scientific community and will, in turn, enhance a beneficent influence of science and technology upon society.

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Akhil Vaidya
Institute for Medical Research,
Camden, New Jersey 08103

Interferon

The interferon system has been recognized as a major defensive response of the host, whether cell or animal, to infection by viruses and possibly by other agents. Apart from its theoretical aspects, interferon is potentially important in human chemotherapy, both in virus and tumor treatment. The current status of interferon research was summarized in a recent international workshop which was held in Williamsburg, Virginia, under the auspices of the Antiviral Substances Program of the National Institute of Allergy and Infectious Diseases.

The first session was devoted to control mechanisms in interferon induction. Studies with metabolic inhibitors have suggested that interferon production by the cell may be controlled in the following way. Messenger RNA (mRNA) for the interferon molecule (a protein) is not expressed in unstimulated cells because of the presence of a repressor protein that binds to the interferon mRNA. When a cell is "induced" to make interferon, the repressor is inactivated, or perhaps its production is stopped, so that the interferon mRNA can be translated. Under some conditions the amount of interferon produced is actually increased in the presence of metabolic inhibitors; one proposed explanation is that the interferon mRNA continues to be produced and translated while the repressor protein is not. Some investigators think that other control mechanisms are likely to operate during transcription.

The event in virus replication that triggers the production of interferon remains only partially defined. Double-stranded forms of RNA are in general better inducers of interferon than are single-stranded forms, and this has been interpreted by some to indicate that the double-stranded nucleic acids formed during virus replication are the triggering entities. However, the fact that under some conditions with Chikungunya virus one can get more than normal amounts of interferon in the absence of any detectable viral RNA synthesis, either single- or double-stranded, would suggest that some activity of the input virion may be the initiating process. Other data suggest that function of virion-bound polymerase may be important in induction by Newcastle disease virus, while with reovirus viral assembly may be responsible.

From studies with derivatives of the synthetic inducer polyinosinic acid-polycytidylic acid [poly(I)·poly(C)] it was concluded that: (i) an unblocked 2'-hydroxy group is needed for activity, and (ii) modifying the structure so as to alter toxicity and activity did not alter the therapeutic index. The possible importance of the cell membrane in interferon induction by poly(I)·poly(C) is becoming increasingly apparent. In regard to stimuli of microbial origin, two materials were discussed: it has been determined that the essential moiety of the lipopolysaccharide interferon stimulator from endotoxin is the lipid A fraction; a soluble protein from Escherichia coli was also described as a potent inducer of interferon.

Included in the second session was a discussion on the molecular mechanism of the antiviral action of interferon. Most investigators agreed that cells initially treated with interferon show a selective defect in the translation of a viral genome. This selection defect has been demonstrated both in whole cells and with cell-free systems. The translation of viral RNA may be inhibited to a much greater extent if the cells that furnish the cell fractions are first treated with interferon and then infected with virus as compared to interferon treatment alone. The factors responsible for the decreased translation are in the cell sap and on the ribosomes. Data were presented indi-
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metabolic inhibitors during production. Prior treatment of cells with small amounts of interferon also increases the yield of new interferon when these cells are subsequently stimulated. With the use of human diploid cells, one laboratory has been able to produce material having a titer of $10^6$ units.

Mouse interferon has been purified to the point of yielding a product with $10^8$ reference units per milligram of protein. No comparable degree of purification has been obtained with human interferon. Two factors that contribute to purification difficulties are (i) the low isoelectric point of human interferon, which precludes the use of certain chromatographic procedures that have been useful with other interferons, and (ii) the apparently greater instability of human interferon.

The various forms of interferon from any one animal species vary considerably in size and charge. Some data have been interpreted to suggest that some, though not necessarily all, of the size heterogeneity comes from the view that native interferons are oligomers containing 2, 4, or 8 identical subunits that can be dissociated at low salt concentrations.

Interferon assays still depend on inhibition of virus replication. In one new method the amounts of specific neuraminidase resulting from influenza virus infection are measured, and this forms the basis for another precise and sensitive interferon assay.

Reference standards of interferon are available for chick, mouse, rabbit, and man; there is also a poly(I) · poly(C) reference standard for interferon inducers. These standards may not be totally satisfactory, but they do provide some means of comparison from one laboratory to another.

With respect to the possible role of interferon in the control of disease, evidence presented from experimental animal models indicates that both exogenous interferon and endogenously induced interferon [poly(I) · poly(C) being the inducer most frequently utilized] have been successful in the prophylaxis and early therapy of lytic as well as oncogenic virus infections.

Criteria utilized for selecting model systems for therapy studies include (i) the host must be at risk from further virus replication, (ii) the virus infection must be sensitive to the quantity of interferon applied, (iii) the host must be responsive to the interferon inducer (even though the prior viral infection may have induced a
state of hyporeactivity to further production of interferon and to interferon, and (iv) interferon, or inducer, must reach the site of infection. Some investigators have found that exogenous interferon is more effective than endogenous; others have found them equally effective. There were also reports of growth inhibitory action against certain protozoa and intracellular shigella. Potentiation by interferon of the toxicity of some double-stranded nucleic acids was also reported.

Problems identified with the potential utilization of exogenous interferon include: the short half-life of exogenously administered interferon in vivo, the low dosages available for therapeutic trials, the difficulty of injection at site of infection in most clinical circumstances, the diffusion gradients between blood and site of infection (such as the blood-brain barrier). Problems associated with inducers [primarily based on data from studies with poly (I) · poly(C)] include: toxicity, possible immunologic alterations, hyporeactivity, and decreased capacity of the infected host to produce interferon. These problems must be considered in planning clinical trials.

The reticuloendothelial system may be the source of the interferon appearing in response to certain inducers. Studies with the low-molecular-weight inducers, such as Tilorone and perhaps endotoxin, have demonstrated that a glass-adherent cell (presumably a macrophage) obtainable only from lymph nodes or spleen, respond with interferon production in vitro. Studies of interferon stimulation by nonspecific mitogens and Newcastle disease virus, as well as with viral and nonviral antigens reacting with immunologically sensitized cells, have demonstrated that interferon (as well as lymphokines) can be produced by stimulated lymphocytes. The immune-specific interferon response is increased by addition of macrophages to lymphocyte cultures. Gradient separation of lymphocytes suggests that the blastic response occurs in cells other than those producing interferon. Studies with antiserums to the theta factor have implicated thymus-derived lymphocytes in interferon response of mouse lymphocytes to concanavalin A, phytohemagglutinin, and pokeweed mitogen.

The administration of old tuberculin causes the production of circulating interferon by mice infected with BCG (Bacille Calmette-Guérin). This interferon, but not other types of interferon, seems to be closely associated with migration inhibitory factor.

Studies of the effect of interferon on lymphocyte function indicate that relatively high titers of interferon diminish the blastogenic response of lymphocytes stimulated by nonspecific mitogens, and that under certain conditions interferon preparations may potentiate antibody production in mice, while under other conditions no enhancement was noted.

When the use of human interferon in patients was discussed, one investigator reported that daily parenteral administration of up to $3 \times 10^8$ units of interferon over periods of up to 1 year produced only some fever and no permanent effects. Diffusion of interferon is known to be retarded by effective blood-brain, blood-eye, and blood-respiratory tract barriers. Poly(I) · poly(C) has also been given to many patients with cancer and neurological disease with no significant metabolic or hematological adverse effects. Rather low levels of circulating interferon were produced by patients receiving poly (I) · poly(C). In one patient (report

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The Animal in its World
Explorations of an Ethologist, 1932-1972, Volume One
Field Studies
by Niko Tinbergen

The founder, with Konrad Lorenz, of the young science of ethology here publishes for the first time in book form his pioneering field studies of animals—including gulls, wasps, and foxes—in their environments.

“Niko Tinbergen is one of the grand masters of ethology.”

—Sir Peter Medawar

“A primary source of data and ideas.”

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from Ottawa) with subacute sclerosing panencephalitis, convulsions apparently were precipitated by administration of intravenous poly(I)·poly(C). Although poly(I)·poly(C) is not oncogenic in hamster or mouse tissue in vitro or in vivo, a strain of rat cells that is highly susceptible to transformation was transformed by poly(I)·poly(C).

Local administration of interferon can prevent cutaneous infection with vaccinia virus in monkeys and in man. Human interferon can retard systemic viral infection of monkeys. In volunteers receiving influenza or rhinovirus, intranasal administration of increasing amounts of interferon gives either no protection or a small protective effect. With even larger doses in monkeys there is significant reduction in the excretion of a parainfluenza virus and of equine rhinovirus. Studies with increased amounts of interferon given intranasally to volunteers are being made. Partial protection against rhinovirus and influenza virus infections and low levels of induced interferon is reported in volunteers given poly(I)·poly(C) as nose drops. Poly(I)·poly(C) administered in eye drops can accelerate healing of herpetic dendritic ulcers; this effect may be due to the influence on corneal cells of interferon induced in the conjunctiva. Tilorone derivatives, which induce interferon in rodents but not in monkeys, prevent viremia in monkeys given Venezuelan equine encephalitis vaccine.

Live infectious bovine rhinotracheitis virus vaccine, which induces interferon if given into the respiratory tract of calves, dramatically reduces symptoms of and subsequent death from respiratory disease occurring in calves kept in feed lots. Rhinovirus infection of man interferes with the take of a live influenza vaccine, and prior injection of rubella vaccine prevents respiratory virus infection; but attenuated influenza virus infection does not protect against experimental parainfluenza infection 1 week later.

Poly(I)·poly(C) treatment of rabbit skin protects against tumors induced by Shope fibroma virus. It also protects against experimental rabies and induces the local production of interferon and a greater amount of antibody. This is an example of the multiple actions brought about by chemical inducers.

Interferon preparations and inducers administered to animals limit the growth of tumors or leukemia and prevent metastases. In patients with severe disease (malignancies, leukemia, and subacute, sclerosing panencephalitis) poly(I)·poly(C) treatment induces low levels of interferon and has no effect on the primary disease.

In man, large amounts of interferon have been detected at the sites of certain, but not all, infections. Long-term production of interferon has been observed in a case of congenital rubella infection. Studies to exploit these phenomena for prophylactic or therapeutic purposes are planned or under way.

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**Personnel Placement**

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Geologist, Ph.D. 1973. Geophysical sciences background, research experience in aeronomy and magnetospheres physics. Desires teaching or research position. Box 267, SCIENCE.

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