SCIENCE

2 October 1959

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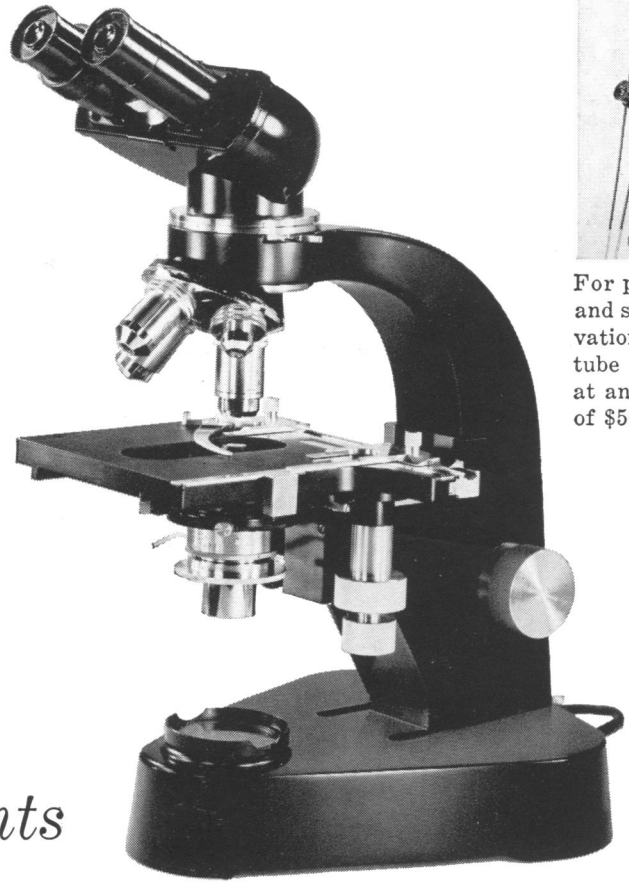

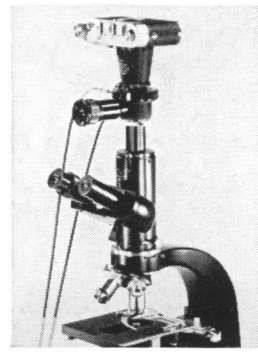

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Cover Electron micrograph of a fractured quartz crystal, taken as part of a basic study of fracture surfaces being made at the National Bureau of Standards. Fracture surfaces are of considerable interest in determining the mode of energy dissipation once fracture has been initiated. The crystal was fractured in tension parallel to the basal planes. Replicas were made by the collodion-carbon double-replica technique, with palladium shadowing. The picture shows "steps" meeting at an angle which suggests the presence of a boundary between twin domains. Fracture markings, similar to those occurring in many materials, appear along with cleavage planes, which are of particular interest in view of the extremely poor cleavage of quartz. Such planes are less prominent in fractures propagated along other crystallographic directions. (14,700) [National Bureau of Standards]

...NEWS IS HAPPENING AT NORTHROP

How the Outer Edge of the Earth's Atmosphere Can Be the Training Ground for Man's First Landing on the Moon

by Norman V. Petersen

Chief of the Astro Systems and Research Laboratories, Norair Division of Northrop Corporation

One of our current studies at Norair shows that a manned capsule can be rocket-launched from the earth in a ballistic trajectory approximating an approach to the moon. A braking rocket blast fired from the capsule would push the vehicle into an earthward turn and place it in landing position above the earth's atmosphere — the same way a space ship would maneuver for a lunar landing. Such a maneuver would permit simulation of the lunar landing maneuver in near vacuum conditions as on the moon. It would utilize the blanket of air about the earth for safe recovery upon re-entry.

We base these particular studies on the use of conventional manned satellite capsules modified by the addition of a braking rocket as the lunar landing trainer and a ballistic rocket booster as the launching vehicle.

The capsule would be ejected at 50 miles altitude after traveling 100 miles from the launch site. Trajectory prior to ejection could be made to simulate either a close orbit approach to the moon, an intersecting elliptic trajectory approach or a vertical approach from a direct earth-moon trajectory. The guidance system would perform automatically during the initial approach, but would be fitted with an "override" feature allowing the pilot to take over the controls during the braking maneuver.

For ten seconds the capsule would hover motionless above the earth's atmosphere — supported by the reverse thrust of the rocket blast. Then the pilot and capsule would re-enter the atmosphere in a low-speed free fall. After re-entry, the descent would be completed by parachute.

Ground-based stations would beam a motion picture display of moon terrain during the braking roeket descent. This, coupled with the capsule's guidance system, would give the pilot an actual impression of steering his vehicle to a moon landing.

This simulated lunar landing study is only one of our many current missile and space programs at Norair. Our range of activity allows the scientist and the engineer to work in research, design *and* development. He is active in the fields of close orbit, lunar and interplanetary flight regimes as well as in research in the many fields of space technology. These fields embrace astrodynamics, astronavigation, space physics, bio-astronautics, space electronics, space materials and processes, space propulsion and space structures.

Work in such challenging areas is stimulating, and the Norair environment is encouraging. For surrounding us are the finest facilities and the vast array of the entire Northrop Corporation's equipment.

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Current papers by Northrop scientists and engineers include:

A Simulator for Lunar Landings
—Norman V. Petersen

The Influence of Launch Conditions on the Friendly Rendezvous of Astrovehicles
—Robert S. Swanson and Norman V. Petersen.

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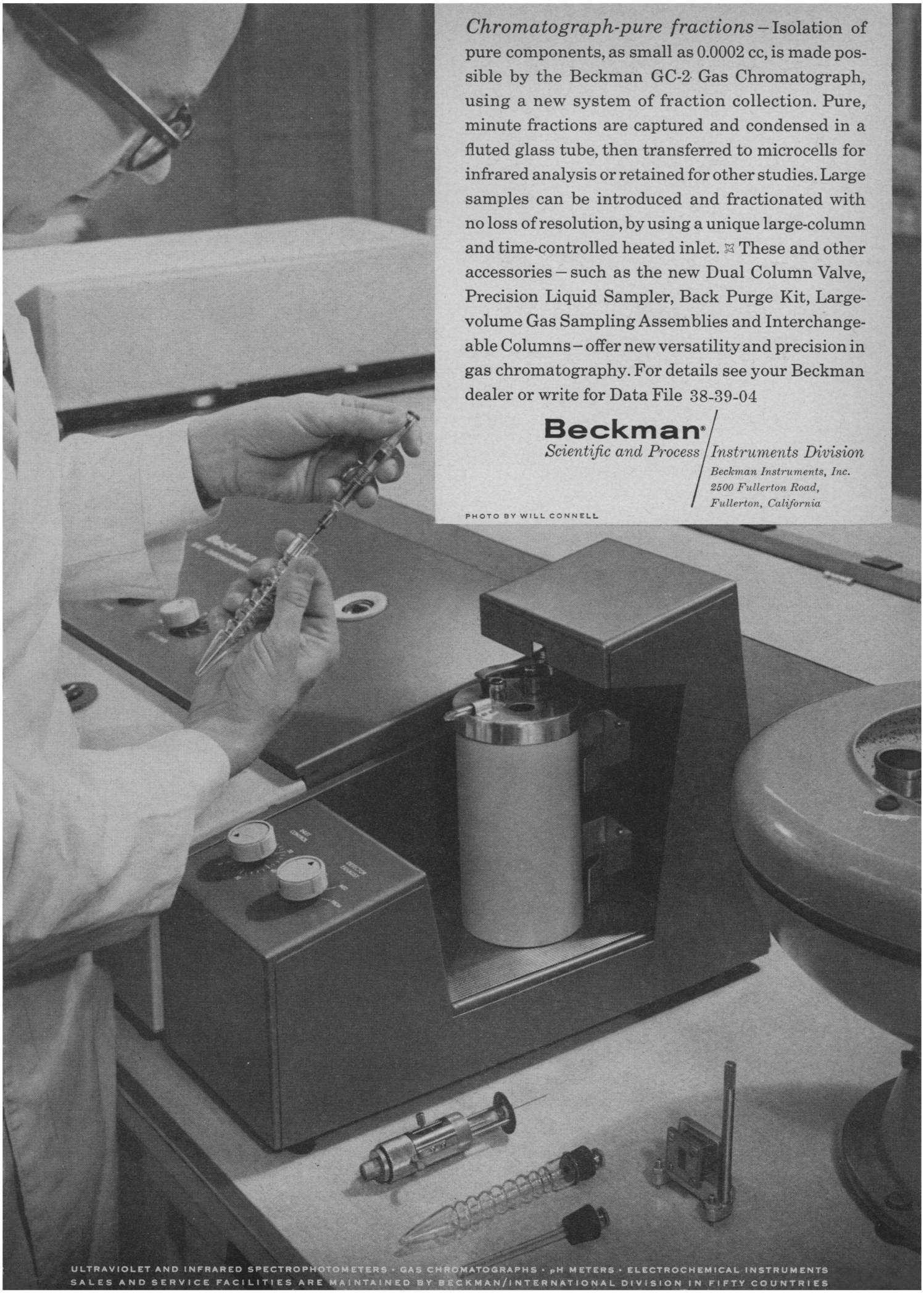

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Letters

Comfort and Environment

Your "Dog days" editorial [*Science* **130**, 131 (1959)] indicates adverse reaction to the "discomfort index" for business reasons. There are additional grounds for dispensing with the new discomfort index. Since human comfort is a rather complex function of ambient temperature, humidity, wind, and radiation load (principally solar, but also infrared as represented by wall temperature in a room), it would appear that a discomfort (or comfort) index should include the effects of all four environmental quantities. Additionally, however, the large individual differences in personal reaction to the physical environment, with both physiological and psychological factors, would appear to make determination of a rational discomfort index a virtual impossibility.

KENNETH H. JEHN
Electrical Engineering Research Laboratory, University of Texas, Austin

Properdin

Having read with great interest D. W. Talmage's "Immunological specificity" [*Science*, **129**, 1643 (1959)], I would like to comment on the hypothesis raised, in reference to the properdin system.

No really satisfactory definition of properdin is available at the present. Although most investigators consider it a discrete entity—"a naturally immune factor"—recent work, especially that of Nelson (*1*), attempts to erase the distinction between the properdin and the classical antibody system. Properdin is considered a "natural antibody of broad if weak spectrum of activity." Although properdin does seem to possess certain distinct physicochemical characteristics, yet discrepancies are found in its immunological activity. For instance, there is lack of correlation of its activity as measured by phage neutralization, zymosan titration, or antimicrobial activity (*2*).

H. Isliker of Bern, Switzerland, indicated recently that properdin is a polymer of 7-S globulins linked reversibly by disulfide bonds (*3*). Thus it may be that the wide spectrum of properdin activity is due to the different affinities of component "natural globulins," and that the lack of correlation in measurements of its activity made by different methods results from variation in the ratios of immunologically different globulins incorporated into the macromolecule.

I have always been impressed by the fact that properdin titers are consistently found to be decreased in infections and malignancies and in military personnel subjected to a massive immunization program (*4*)—all conditions involving a specific antibody formation. As this had never been adequately explained, we felt that something in the nature of a "competitive equilibrium" was involved—properdin polymer dissociating into its component globulins which were then "retooled" to fit the antigens flooding the organism. With Talmage's hypothesis, such a "retooling" would not be deemed necessary, with natural globulins reaggregating into specific complementary patterns. This hypothesis should certainly be easy enough to check experimentally with labeled globulins.

I certainly agree with Talmage that it would be of interest to check whether properdin could be inhibited by the mechanisms of immune tolerance. Zymosan would seem to be the logical inhibitory agent. Such an experiment would be helpful in elucidating the true nature of properdin. A finding of complete suppression would tend perhaps to strengthen the position of those who consider it a natural antibody. Also, it would provide an opportunity to ascertain properdin's role as a defense mechanism.

MICHAEL W. RYTEL
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References

1. R. A. Nelson, *J. Exptl. Med.* **108**, 515 (1958).
2. K. M. Cowan, *Science* **128**, 778 (1958).
3. H. Isliker, *Proc. Intern. Congr. Biochem., 10th Congr., Vienna* (1958).
4. I. Schultz and G. H. Stollerman, *Clin. Research Proc.* **5**, 304 (1957).

Without commenting directly on Rytel's interesting hypothesis of the nature of properdin, I would like to clarify an apparent misunderstanding of the word *combination* as used in my article. I used the word in its abstract mathematical sense to indicate the number of different ways that independently reactive globulin molecules can be grouped. There was certainly no intention of implying a physical aggregation of natural globulin molecules. Studies with sulfur-35 amino acid incorporation in a number of laboratories have clearly shown that antibodies are formed directly from amino acids *de novo*—that is, not from preexisting globulin or other protein precursors.

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