lime exhibited nontransmissible wood pitting. Some seedlings were from an old tree that was severely pitted. Whether the parent tree was infected with xyloporosis virus, which produces wood pitting symptoms, was not stated. Virus and nonvirus variegation is common in camellia, abutilon, and some other ornamental plants.

At this time one can only speculate about the mechanism involved in the production of seedlings with the genetic abnormalities described here. One possibility might be an effect of virus nucleic acid on host nuclear material, with the virus nucleic acid actually becoming a part of the host genome and so coming under the control of the host nucleus.

The condition described here in cherry may be somewhat analogous to lysogeny in certain bacteria, though information is too meager for a really meaningful comparison. In *Corynebacterium diphtheriae*, for example, Freeman (*5*) and Groman (*6*) showed a correlation between toxin production and lysogeny. In that case the prophage profoundly altered the physiology of the cell, yet the phage was in a noninfectious state. Likewise with the condition in cherry: the virus-like symptoms are evident and abundant though no infectious agent can be demonstrated by grafting. The symptoms are perpetuated by bud propagation and also pass through the seeds. If there is some interaction of virus and host genome, this interaction may, without preventing symptom expression, limit movement of the virus in the host to its transfer from cell to cell during mitosis. Such a situation would prevent transmission of the virus across a graft union.

If viruses can effect permanent genetic changes in the higher plants, their role in the evolutionary process must be considered.

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13 July 1962

Determination of the Mixing Ratios of Water Vapor and Carbon Dioxide in the Stratosphere

Abstract. Values for water vapor mixing ratio (0.32 g/kg) and carbon dioxide content (0.030 percent by volume) were measured at 119,300 feet and are compared with values obtained by others at lower altitudes.

Many investigators have measured the water vapor content of the stratosphere (*1–3*). However, no measurements have been reported for altitudes above 100,000 feet. Most investigators have used hygrometers of the frost-point type. On 2 May 1962 our group collected a sample of water from the air at an altitude of nearly 120,000 feet by a balloon-borne sampling system and recovered it for analysis (*4*).

An adsorbent pump (see Fig. 1) with an adsorbent bed of synthetic zeolite (*5*) cooled by liquid nitrogen was developed to sample a large volume of stratospheric air. The pump's capacity is 130 standard cubic feet of air at altitudes up to 150,000 feet. A second, specially prepared adsorbent bed was used to collect water vapor and carbon dioxide from the sampled air. This second bed, 2 inches thick, was sealed by two ball valves, one each at the inlet and outlet of the air stream. The pump's adsorbent bed (the first bed) was designed to keep the adsorbent at liquid nitrogen temperature throughout the sampling period. The collection bed was at ambient temperature. A pressure relief valve on the liquid nitrogen chamber kept the nitrogen from either building up to high pressures or solidifying at the reduced pressures of high altitudes.

To eliminate balloon-borne contamination, the adsorbent pump was located 150 feet below the balloon. After the balloon system had reached a float altitude of 119,300 feet, the two valves on the collection bed were opened. The inlet valve allowed ambient air to enter the collection bed chamber. The outlet valve, which is the inlet to the pump proper, allowed the air in the collection chamber to pass into the pump, where it was adsorbed. The adsorption process pulled ambient air through the collection bed where the water vapor and carbon dioxide were removed. The dry, CO_2-free air was then absorbed in the pump's zeolite bed.

At the end of a 180-minute sampling period, the valves were closed, and the adsorbent pump system was recovered by parachute. A flowmeter was used to determine flow rate and total volume flow during the sampling period. In addition, all of the sampled air (127 standard cubic feet) retained by the adsorbent pump was subsequently measured. Values from both recovered air and flowmeter measurements were in good agreement.

Both the water vapor and carbon dioxide were recovered from the collection bed by regenerating the adsorbent of the collection bed. The regeneration process consisted of heating and pumping on the adsorbent and collecting the desorbed water vapor and carbon dioxide in a liquid-nitrogen cold trap. The water vapor and carbon dioxide were then separated by differential distillation and measured.

The calculated mixing ratio of carbon dioxide on the 2 May flight was 0.030 percent by volume. This is within experimental error, considering flow measurement and altitude determination errors, of the generally accepted value of 0.031 percent.

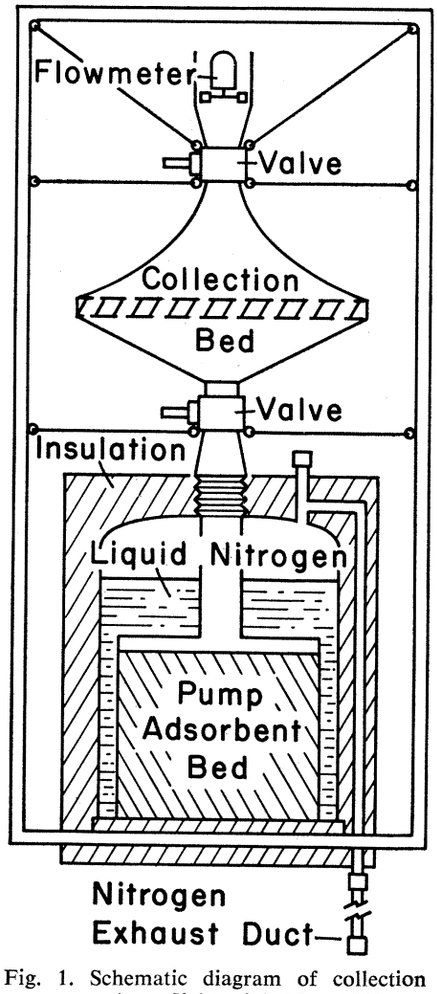

Fig. 1. Schematic diagram of collection system used on flight of 2 May 1962.

The amount of water vapor collected on the flight corresponds to a mixing ratio of 0.32 g/kg. This value is slightly less than a value for a corresponding altitude taken from an extrapolation of the 27 June 1960 curve of Mastenbrook (*2*). This curve was chosen since it includes Barclay's point and Mastenbrook feels it is the most reliable one available at the present time (*2, 6*). An attempt was made to keep the water vapor contamination to a minimum. However, because of various possible sources of contamination, the value of 0.32 g/kg is presented only as a maximum value for the altitude.

Although at present only one flight has been made with this equipment, other flights are anticipated.

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20 July 1962

Neuroepithelial Component of the Urethra and Urogenital Junction of the Rat

Abstract. Specialized cells in the epithelium react for cholinesterases when tested by the Koelle thiocholine method. Their morphology and contiguity with cholinesterase-positive nerves suggests receptor function. Impulses originating from them might relate to sensations or muscular reflexes involved in micturition and ejaculation, or both. If they are effector units, special secretory, excretory, or absorptive functions are indicated for cells of probable neural origin.

During a study of the histochemical distribution of cholinesterase in the urogenital organs of the male rat (*1*), certain reactive cells were observed in the epithelium of the urogenital junction and urethra. Similar cells do not appear to have been recognized or described by previous investigators, who used histological or histochemical methods. Because of the apparently unique nature of these cells, it is desirable to record their occurrence and to consider briefly their probable significance.

Formol-saline fixed and frozen sections (30 to 40 μ) of the urogenital junction, including the urethra, neck of the urinary bladder, and adjacent reproductive ducts and glands of the white rat, were prepared. They were then treated for the demonstration of cholinesterase localization by the thiocholine methods of Koelle and Friedenwald (*2*) and Koelle (*3*). Appropriate inhibitors of the reaction served as controls. Both acetylthiocholine and butyrylthiocholine substrates at *p*H 5.6 give positive reactions with 1 hour of incubation; best results occur when the former is used.

According to Koelle (*3*), Dumont (*4*), and Gerebtoff (*5*), the epithelium of the urinary bladder is negative for cholinesterase, but abundant cholinesterase-positive nerves and ganglion cells are present. These workers do not refer to the reactive cells considered here. Gerebtzoff did not observe them in the guinea-pig urethra, and we have not seen them in the mouse (*Peromyscus*). The rat, therefore, may be a special case. Investigators of the innervation of the urinary bladder and urethra [Langworthy and Murphy (*6*), Watanabe (*7*), Ojima (*8*), and Mori (*9*)] who used traditional silver or intravitam methylene blue methods do not mention these cells. No reference is made by Stöhr to the occurrence of neuroepithelial end-organs in this region (*10*).

The epithelium of the urinary bladder, ureters, and the tapering neck region is entirely negative with either substrate used. However, where the walls begin to fold longitudinally, individual flask-shaped cells that react positively make their appearance among the negative epithelial elements (Fig. 1). The cells are uniformly stained throughout their cytoplasm, and their shape is distinctive. They may have a length of 35 to 40 μ. Round or oval nuclei occupy the thickest part of the cells near the basement membrane. A narrow process extends from the cell-body to the inner surface of the epithelial layer and terminates in a distinct pit or notch. The ends of the processes occur at about 15-μ intervals at the surface of the epithelium. Occasional cells appear to be slightly branched, and two terminations may be present. At the basal end of each cell an expanded fan-like expansion or process retains an attachment or contact with the underlying positive nerve network that is present abundantly about the urogenital junction. It is not difficult to detect the contact (synaptic?) between the cells and the nerve plexus, and clear evidence of an anatomical relationship is observable. On this basis, we conclude that the reactive cells represent a sensory or motor element of some type and that they probably are derived from the Schwann cell elements of the nerve plexus.

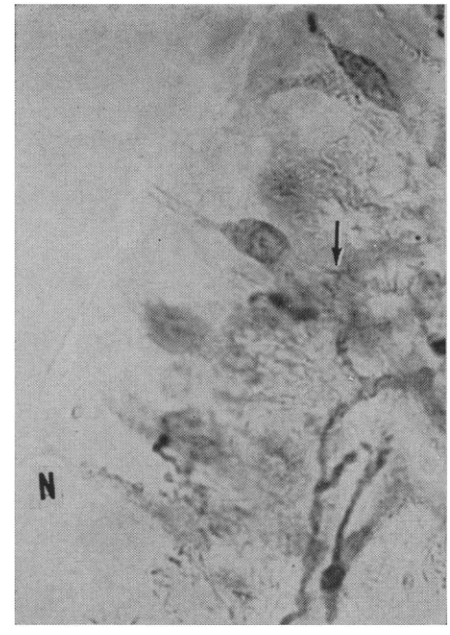

Fig. 1. Longitudinal section (40 μ) of male rat urethral epithelium and submucosa. Acetylthiocholine, Koelle method (× 750). Two reactive cells in sharp focus above the center are in the epithelium. Note basal expansion toward nerve at arrow; notch (*N*) indicates termination of another cell from a deeper focal plane; nerves at lower right.

The cells are distributed at more or less regular intervals, about three to four cell-body diameters apart, and they occur throughout the proximal urethra for a distance of about 7.5 mm. In males, they occur in the prostatic urethra and can be traced into the narrow prostatic ducts, the terminal ejaculatory ducts, and vesicular ducts. None have been found in the vasa deferentia where the epithelium is enzyme-positive (*11*). In females they are structurally similar to those in the male but are limited to the urethral folds. They are present in 18-day-old fetuses.

The shape and orientation of the cells call to mind the classical descriptions of simple unicellular receptors found in the integument of invertebrates and lower vertebrates, and commonly recognized as chemoreceptors. In the urethra, the presence of urine or other materials, such as semen or some seminal component in males, could provide either chemical or pressure stimuli. Thus the cells might be receptors generating afferent impulses leading to sensations,