Letters

Pay of Government Scientists

While the academic scientist and the industrial scientist "unite in looking down upon their image of the government scientist" ("Scientists and their images," *Science*, 24 Jan., p. 311), has the academic or the industrial scientist ever stopped to consider that without the government's subsidy they could well be without jobs or at any rate not enjoying the personal and scientific gains they do today?

The image of the government scientist has in fact been created by the government itself. Until the government respects its own scientists, the image will remain regardless of the fact that government scientists are as dedicated and contribute as much to science as do industrial and academic scientists. The United States Public Health Service employs 3744 physicians and dentists and 228 scientists in its Commissioned Corps. All 288 of the scientists hold a Ph.D. In determining years of service creditable for pay purposes, physicians and dentists in the Corps are given 4 years' credit for their professional education, and physicians are given an additional year's credit for their medical internship. A scientist with a Ph.D. receives no such credits for his professional education. To illustrate, a medical or dental intern upon entering the service at the same rank (Senior Assistant Grade) as a scientist would receive $193.96 a month more than the scientist as a result of professional-education credit. In addition, the physician and the dentist upon completion of their internships receive what is called incentive pay, which amounts to from $100 to $350 a month (depending on length of service) which the scientist does not receive. Veterinarians are also entitled to incentive pay.

With the government encouraging the advancement of science, it is difficult to understand how it rationalizes the discrimination against the Ph.D. scientist, particularly within the USPHS. It is no wonder that recruitment and retention of scientists by the government has become an ever-increasing problem. In spite of the protests of the 228 scientists in the USPHS Commissioned Corps and in spite of the various committee reports recommending more fitting compensation to the scientists, remedial action has been forestalled or refused year after year.

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X-ray Hazard from Electron Microscopes

Although new electron microscopes are carefully checked for x-ray emission at the time of installation, it is uncommon to continue checking them on a daily basis after a period of years has elapsed during which no hazard has developed. We therefore wish to alert electron microscopists, particularly those engaged in high voltage operation, to a hazard which may develop. First, a word about normal behavior. On switching on our instrument on the 100-kilovolt range after it has been shut down overnight, a semicontinuous discharge occurs in the gun, and a high level of x-rays is emitted, accompanied by a gun-current reading which may exceed 60 microamperes although the filament is unheated. The x-ray emission and current fall with time and become negligible within 4 minutes or less. This "transient emission of x-rays" is believed to be normal behavior and results in only a small cumulative dose to the operator, since the high level (which may exceed 200 milliroentgens per hour close to the gun) is encountered for only a short time on switching on and gradually decays. On two occasions during the last 6 years, however, x-ray emission was observed which persisted for long periods.

The first incident occurred when oil vapor was drawn from the diffusion pump into the column because of failure of a sealing ring in the column. For a week or two after this occurrence, continuous x-ray emission was observed in an upward direction from the base of the gun whenever 100 kv was applied, accompanied by a gun-current reading due to the ion current. The level of x-ray emission and the gun current gradually decreased with continuous pumping as the column "cleaned up," and became negligible after 2 or 3 weeks. A film radiation badge was placed against the gun after this occurrence and gave no appreciable reading until the following incident occurred.

On routine checking about 2 years later, continuous emission of x-rays was again detected at 100 kv. A cone of x-rays was emitted, inclined about 20 degrees downward from the horizontal and slightly to the right of the operator in this vertical-column instrument. A radiation level of 250 mr/hr was measured at a distance of 0.3 meter from the gun on switching on and did not decay below about 100 mr/hr, corresponding to a gun-current reading of about 10 microamperes. No x-rays were emitted at 80 kv, presumably because they could not penetrate the gun casing. A further observation was that the continuous x-ray emission could be stopped by reducing the operating pressure in the column to between 10^{-3} and 10^{-4} torr, either by putting a controlled leak in the column or by closing off the column from the pumps with poorly outgassed plates loaded. X-ray emission recommenced when the vacuum reached 10^{-4} to 10^{-5} torr. The x-ray level was substantially reduced by cleaning the vacuum system and changing the pump oil. However, it was not until the manufacturers replaced the insulator, to remove a suspected oil leak from the high-voltage cable, that x-ray emission returned to normal transient behavior.

We suggest that x-ray generation results from decomposition of oil vapor in the potential field of the gun, probably at rough spots on the cathode assembly, giving rise to positive ions which impinge on the cathode (−100 kv), exciting secondary electrons which then impinge on the grounded