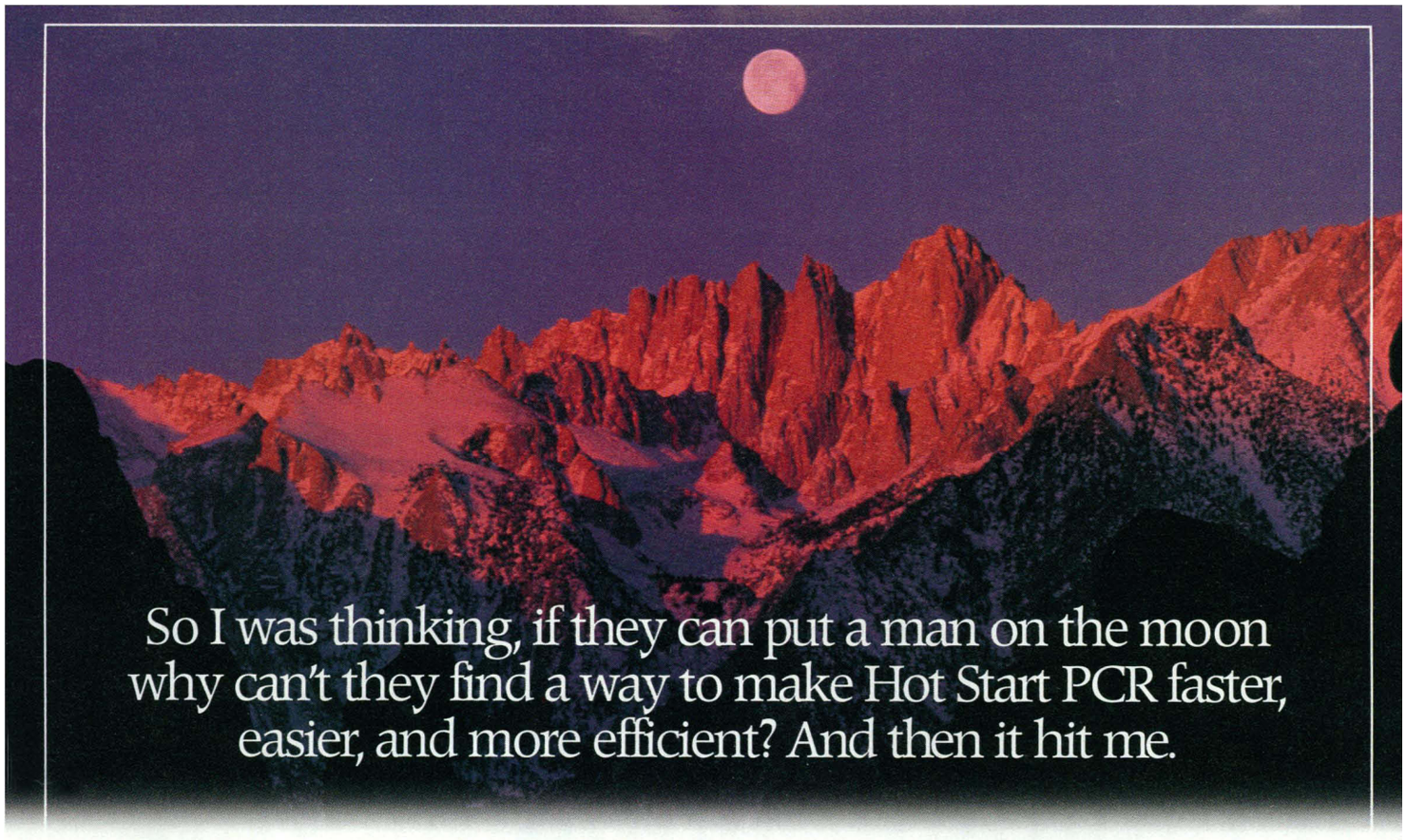

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ed in the animals subcutaneously. The rationale was to use the minimum quantities that would produce the desired effect. Although there were no Food and Drug Administration (FDA) guidelines in this area in the 1940s, we also investigated the possible retention of DES in the edible tissues of treated animals. The single implantation of 24 to 36 milligrams (mg) of DES proved to be safe and practical.

Several years later, investigators at the Iowa Agricultural Experiment Station showed that the oral administration of DES at a level of 10 mg per day in feed would increase the growth of cattle, and the method was quickly accepted by the feed industry and cattle raisers. Browne's review does not comment on the wide differences in the amounts of DES used by the Purdue and the Iowa investigators. In a feeding period of 100 days (and it was usually longer), 1000 mg of DES were consumed in the Iowa studies. This was in marked contrast with the 24 to 36 mg of the Purdue studies.

All of the Purdue studies were carried out with the modest funds of the Agricultural Experiment Station. There was no attempt to seek patent protection. The results were made public in their entirety at scientific meetings, in reviewed journals, and at field days for livestock producers. There was no support from Pfizer; their program using DES pellets was initiated several years after the Purdue findings.

By the late 1950s and 1960s, the beef cattle industry was making widespread use of DES as a growth stimulant, and the FDA established a withdrawal period before slaughter when the oral method was used. When 10 mg per day of DES were fed, residues could be found in the liver, unless there was a withdrawal period of about 2 days.

Although no case of cancer has ever been attributed to the consumption of meat from DES-treated cattle or sheep, the Purdue group had begun a search for a nonsteroidal, nonstilbene-related substance with anabolic activity. In the 1950s, such a substance was found in the common corn mold *Gibberella zeae*. The structure was identified and was named Zearalenone. A large number of derivatives were synthesized by the Commercial Solvents Company in Indiana. One of them, Zeranol, was more active than Zearalenone and was accepted by the FDA as an anabolic substance and approved for use in cattle and sheep. It is now used worldwide. Extensive studies confirmed that there were no residue problems. Additional studies carried out in several species, including primates, revealed no evidence of carcinogenicity. It was generally accepted that DES, under certain conditions and in certain species, had been classified as a carcinogen.

The book by Marcus provides further evidence that Congress and the FDA should rethink the ramifications of the Delaney Amendment.

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Apology

In my letter of 20 January (p. 314), I wrote that Peter H. Duesberg "repeatedly and publicly has accused many of those who disagree with him of . . . 'genocide.' " This term was incorrectly attributed to Duesberg in a newspaper report that was my source for the quote. I apologize for this inadvertent error.

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