16–21. Radiological Soc. of North America, Chicago, Ill. (D. S. Childs, 713 E. Genesee St., Syracuse, N.Y.)

16–23. Scientific Information, intern. conf., Washington, D.C. (Mrs. M. Sheppard, Intern. Conf. on Scientific Information, Natl. Acad. of Sciences–Natl. Research Council, 2101 Constitution Ave., Washington 25.)

17–20. Conference on Magnetism and Magnetic Materials, Philadelphia, Pa. (H. B. Callen, Dept. of Physics, Univ. of Pennsylvania, Philadelphia.)

18–20. Air Pollution, 1st natl. conf., Washington, D.C. (Dept. of Health, Education, and Welfare, U.S. Public Health Service, Washington 25.)

(See issue of 19 September for comprehensive list)

Letters

Radioactive Wrist Watches

J. L. Haybittle, of the Radiotherapeutic Center at Addenbrooke's Hospital in Cambridge, England, has reported in *Nature* (17 May 1958) that some luminous-dial wrist watches contain sufficient radium to subject their owners to nearly two-thirds the maximum permissible level for exposure of hands and forearms. According to Haybittle, one watch, having an estimated radium content of 2.2 μc, recorded on a film placed in contact with the back of the watch a dose rate of 8 mr/hr.

During the past year we have been investigating the degree of radioactivity of luminous-dial wrist watches as these were made available to us by their owners. Watches were found to vary more than tenfold in their activity. Of 20 watches examined, 12 showed activity not exceeding 1 mr/hr at a distance of approximately 1 in. from the face of the watch, four registered between 1 and 5 mr/hr, two between 5 and 8 mr/hr, and two between 8 and 10 mr/hr.

With an activity of 8 mr/hr at a distance of 1 in., it may be calculated that at a distance of 8 in. a wrist watch worn 24 hours a day can deliver 1.1 r a year; this is the dosage that might be delivered to the gonads by the most active watches when the watch is worn on the wrist in a position facing the gonads. The least active watches could deliver approximately one-tenth this activity, or 110 mr/yr (at 8 in.); at 12 in. this would be reduced to about 49 mr/yr, in good agreement with the dosage of 40 mr/yr estimated by Libby in *Science* [**122**, 57 (1955)] for a wrist-watch radiation source at an average distance of 12 in. from the central body, including sex organs. The potentially harmful magnitude of the radiation from the most active watches, corresponding to 5 rem in about 5 years, may be judged in the light of the recommendation by the International Commission on Radiation Protection that no one should receive a dose in excess of 5 rem by age 30.

When one further considers that this radiation is several times greater than natural background radiation and exceeds by more than 100 times that presently received from radioactive fallout, the potential hazard to the wearer of a luminous-dial wrist watch raises the question as to whether the small benefit that may be received from such a watch is worth the hazard.

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Drug Synergism

In the report entitled "Drug synergism (potentiation) in pain relief in man: papaverine and morphine," by Macris, Gravenstein, Reichle, and Beecher [*Science* **128**, 84 (1958)], the authors found "that less pain relief is obtained from morphine not preceded by papaverine." In their interpretation of this finding the authors conclude that "synergism in the relief of pathological pain has been clearly demonstrated with analgesic drugs." The authors also point out that papaverine alone has no analgesic power.

According to the methods described or referred to as having been employed in this study, it would appear that some patients in a group of 18 received a chemically effective analgesic (morphine) soon after surgery whereas the remainder of the group did not receive this treatment until at least 2 hours later, after they first had been given an ineffective treatment (papaverine). If this is so, it is possible to explain the results that were obtained on the basis of (i) differences in the duration of pain before chemically effective analgesia or (ii) the influence of prior experience with the ineffective papaverine treatment upon subjective reactions to morphine. Neither of these explanations implies drug synergy. That is, it is possible that the patients whose pain remained untreated for the longer period simply appreciated eventual treatment to a greater extent and, consequently, judged the treatment to be more effective. Or, by comparison with an ineffective treatment, the perceived effects of an active treatment may have been enhanced over those perceived without any reference.

It might be argued that these alternative interpretations of the findings in this study are less plausible than the synergy explanation offered by the authors. However, it would seem that the very existence of alternative explanations that are consistent with the literature on subjective measurement raises an appreciable doubt that, in this study, pharmacologic synergy" has been clearly demonstrated."

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In clarifying the situation, points to emphasize are the following: (i) patients do not know what they are getting; (ii) the order of drug administration is randomized; (iii) papaverine itself is equally ineffective as an analgesic whether it follows or precedes morphine. This could hardly be so if Ritter's argument is correct. In view of this we do not believe that Ritter's points (i) and (ii) have validity, although we have of course discussed such an "explanation" over the years. Evidence is lacking here that a subsequent dose is significantly influenced by the fact of a single postoperative medication. If this is not the case, we must have better grounds for giving up this positive evidence than Ritter's vague reference to the "literature on subjective measurement." I am familiar with this literature, having just completed a long book on the *Measurement of Subjective Responses* with over 1000 references, but I do not know what Ritter refers to. As we said in the report, "No clue about the nature of this interaction is available."

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