results of Wigand and Wenk who found the following range of values in a series of airplane measurements:

Altitude (km)	Radon content (10^{-18} c./cm³)
0·35–1·5	428–28
2·0 –2·3	0–24

The regular course of the curves reproduced by Warburton *et al.*[1] from 2·5 km upwards is in agreement with Wigand and Wenk's finding that practically no radon exists above 2·5 km. With regard to their short life-time, it is unlikely that lead-214 and bismuth-214 could ascend from lower altitudes to those explored by Warburton *et al.* and be detected by scintillation counter.

The large variations in counting at lower altitudes, and mainly under the temperature inversion layers, agree with the findings of various authors before the Second World War, that at such atmospheric conditions the radon content varies erratically and sometimes presents exceptionally high values near the inversion layers[3].

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[1] Warburton, J. A., Fookes, R. A., and Watt, J. S., *Nature*, **207**, 181 (1965).
[2] Wigand, A., and Wenk, F., *Ann. d. Phys.* (4), **86**, 657 (1928).
[3] In *Compendium of Meteorology*, edit. by Malone, T. F., 155 (Boston, 1951).

On the Combination of an Electron Spin Resonance Spectrometer and a Multichannel Analyser

In a recent communication, Kent and Mallard[1] pointed out that the versatility of an electron spin resonance-spectrometer can be considerably improved by combining it with an analogue digital converter and a commercial multichannel analyser as they are commonly used in nuclear spectroscopy. We have used a similar piece of equipment, and have already presented a preliminary report[2]. The basic technique was introduced by Klein and Barton[3]. It should be noted that any real improvement is based on the fact that the noise seen in electron spin resonance-spectra is not 'white noise'. That is to say that the probability for a certain frequency to occur in the noise-spectrum is not equal for all frequencies, but is enhanced for lower values[3]. It is therefore clear that no higher sensitivity can be achieved if the time constant of the amplifier and the recording time are enhanced above a certain limit being about 100 sec for the time-constant[4]. The sensitivity is restricted, for example, by instabilities of the whole equipment. This applies to relatively long times of measurement. If the recording time is short, a sampling procedure as described by Kent and Mallard[1] is not expected to bring any improvement if the time-constant is correctly adjusted. Thus the subdivision of one measurement into ten single ones appears to offer no advantage and the same result may be obtained by increasing the apparatus time constant or by repeating ten times the recording of the whole spectrum at a higher speed. The basic law of communication theory, namely, that any improvement in signal-to-noise ratio requires an increase in time of measurement, cannot be overcome by any of these methods.

We have used an '*AEG*'-electron spin resonance-spectrometer (12-cm magnet) in combination with a self-designed analogue-digital converter and a commercial 'Intertechnique'-400-channel analyser. In order to ensure correct superposition of the spectra, the start of each measuring cycle is triggered by a signal from a nuclear magnetic resonance magnetic-field meter, shaped by a special circuit, to the flow-time input of the analyser. Thus it was possible to superpose more than 1,000 single spectra yielding an improvement in signal-to-noise ratio by a factor of more than 30.

In preliminary experiments we were able to detect 10^{-7} M Mn^{2+} in aqueous solution. A more detailed account of our device and the measurements carried out will be published elsewhere.

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[1] Kent, M., and Mallard, J. R., *Nature*, **207**, 1195 (1965).
[2] Kiefer, J., and Neubacher, H., paper read at the Second Symposium on Electrochemical Methods in Biology, Jena, April 1965 (to be published in *Abhandl. Deutsche Akad. Wiss.*).
[3] Klein, M. P., and Barton, G. W., *Paramagnetic Resonance*, edit. by Low, W., 698 (Academic Press, 1963); *Rev. Sci. Instrum.*, **34**, 754 (1963).
[4] Schneider, F. (personal communication).

We agree in principle with the conclusion of Kiefer and Neubacher on the multi-sampling method. However, this was not the main point of our communication—this sort of work has been introduced before by Klein and Barton; our interest lay mainly in the other versatile features that we described. We have, however, some comment to make, following this note by Kiefer and Neubacher. They say that the same result (as the multi-sampling method) is obtained by (i) increasing the apparatus time constant, or by (ii) repeating 10 times the recording of the whole spectrum at a higher speed (with single samples per channel, and, we presume, with a shorter time constant).

We assume by (i) that they also mean that the duration of the sweep should be increased as the time constant has already been selected as optimum for the spectrum involved and any increase in the time constant, without a proportionate increase in sweep period, would result in distortion of the spectrum. The advantage of this would then appear to be obscure since to achieve the same result one would need to take a longer time.

Statement (ii) appears to be merely a reiteration of our statement that N sweeps of a spectrum, with 10 samples of signal and noise per channel per sweep, represent $10N$ faster sweeps. We admit our error in failing to add the important point that we meant 'faster sweeps'. It has been our experience that, whenever the sensitivity of instruments has been in dispute, the contenders frequently fall into the trap of failing to state all the conditions under which the sensitivity was measured, such as time constant, sweep speed, and so on. It would appear that we also have fallen into this trap on this occasion.

We found on our machine that, as we stated in our original communication, interference from 50 c/s ripple coherent with the analyser channel periods tended to obscure information so that, if we performed $10N$ fast sweeps, the 50 c/s ripple would be accentuated $10N$ times, whereas by performing N slower sweeps with 10 multi-samples, this does not occur. We would, however, hasten to add that the multi-sampling method has no advantage over single-sampling methods when enhancement of signal-to-noise is related to the result of just one sweep performed in the same time at the same time constant. We hope that we have now made this point clearer.

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Asymmetric Nuclear Fission and the Liquid Drop Model

In a previous article[1] we directed attention to the resemblance between curves representing the division of electrically charged liquid drops and mass yield curves for nuclear fission.

More recently, we have become aware of fission yield data which further illustrate this resemblance. The two sets of curves in Fig. 1 are a photograph of original drawings. We reproduce, on the left, the fission yield obtained by Gibson[2] for fission of plutonium-239 induced by bombardment with deuterons of various energies, and, on the right, Fig. 5 of our previous paper[1]. In the latter we had plotted the fractional energy change, E_f, versus the fractional volume change, V_f, for the division of a surface-