Their contribution to the activity at the time of elution varied between 70 and 99% depending on several factors including the extent to which the column had been washed.

In that our study of Supplier I's generators terminated in December 1970, when the article was accepted for publication, Dr. Barrall may well be correct in stating that our results are not typical of impurities in eluents from "present-day" generators. However, the most recent generator from Supplier I which we studied was received on December 14, 1970. The activity in the initial eluent of this generator was approximately one-thousand-fold greater at 600 keV than in the eluent of a generator from Supplier II. The half-life of the 600-keV peak after subtraction of the ^{134}Cs component was 60 days. The ^{134}Cs component contributed 22% of the activity at the time of elution. It is our opinion that this generator had significant ^{124}Sb contamination. No ^{95}Zr was identified.

It is important to reiterate that both Dr. Barrall and our laboratory have the same objective. We have identified different major contaminants in different generator eluents. Samples studied in our laboratory from one supplier's generator revealed ^{124}Sb and ^{95}Zr as the major contaminants, along with some ^{134}Cs. In Dr. Barrall's sample, the principal contaminant at these energies was ^{134}Cs. Both laboratories intend, by identification of impurities, to improve the quality of radiopharmaceuticals.

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UNIDIRECTIONAL SCANNING

Many people remain unaware of the outstanding advantage that is achieved by the use of unidirectional scanning. We cannot emphasize too strongly that this is not a matter of academic interest but one which affects in a radical manner the quality of the results achieved whenever a rectilinear scanner is in use. We have used unidirectional scanning and long space constants in this hospital for several years past, and our experience leaves no room for doubt of the great gain that has resulted.

Dr. Simons and Dr. Kereiakes find it difficult to accept our statement (*1*) that, for a given total scan time, better statistics can always be obtained by unidirectional rather than by bidirectional scanning provided the display is modulated solely by the ratemeter output. They claim we are in error because we have overlooked the dependence of information density on scan speed. That this does not, in fact, affect our argument can be simply demonstrated by considering a conventional variable dot color scan. In such a display, the dots are derived directly from the detected pulses, and the variations in dot density relate linearly to the variations in information density. The color changes, however, are produced solely by the ratemeter output fluctuations which depend only on the pulse rate and the time constant and are independent of scan speed. The quality of the contours derived from the color changes are therefore independent of changes in information density when the latter occur as a consequence of variations in scan speed. If the tapper is now activated at an appropriate constant rate from a pulse generator instead of by the detected pulses, then the display becomes totally independent of scan speed. However, an upper limit is imposed ultimately for any given choice of ratemeter time constant by the inability of the ratemeter output to follow faithfully changes to its input.

Constant dot color scans are, in any case, to be preferred to variable dot scans because the dot spacing in the latter results in a dissipation of the colors. Furthermore, the dot-density image is spatially separated from the color image by a distance equal to the product of the scan speed and time constant, i.e., by the space constant, and this must lend confusion to the display.

The photoscan differs from the color scan in that both the triggering pulse rate and the ratemeter output modulate the same parameter, i.e., the film exposure. Nevertheless, if the light source is operated at an appropriate constant pulse rate and the light intensity variation is derived solely from the ratemeter output, then the argument that the display is independent of the scan speed still applies.

The statement that the result of a scan conducted under the conditions outlined is independent of the speed of the scan might appear at first sight to be fallacious because clearly if the scan speed is reduced the count density is increased. It is a fair question to ask what happens to this additional information. In fact it is absorbed by the improvement in the spatial resolving power of the display system. However, if this is already much finer than that of the detecting system, there is no resultant visible improvement in the scan display. Thus a major part of the information gathered in a bidirectional scan

is not used simply because a display system with a spatial resolving power at least an order better than that of the detecting system is required in order to keep the scalloping within acceptable limits.

Dr. Simons and Dr. Kereiakes complain that we offered no analysis to prove our statement that when unidirectional scanning is used instead of bidirectional scanning the information lost in the "fly-back" periods is more than offset by the increased statistical accuracy afforded by the longer space constants. The result of any such analysis is implicit in our quoted example in which we showed that of the 15 min taken in a typical unidirectional brain scan, 2½ min were lost due to "fly-back", whereas the time required for a bidirectional scan with equivalent display statistics was about 200 min if the displacement between successive scan lines was limited to 1 mm.

The time loss due to the silent "fly-back" periods in unidirectional scanning is generally relatively small as demonstrated in the foregoing example. In principle, bidirectional scanning can be retained and this small time loss avoided if the spatial lag on each scan line is offset by mechanical or electronic means. However, as long as a conventional ratemeter with an exponential response is used, distortions will still occur in opposite directions on successive scan lines which again restrict the length of the space constant that may be used. This difficulty can be overcome by the use of a digital ratemeter. Simmons, Hunkar, and Kereiakes found that such a device offered little practical advantage when using short space constants (*2*) but overlooked the benefit to be derived when long space constants were used. It was this omission that led to our original contribution to this correspondence (*3*).

When a digital ratemeter plus scan-line-offset system is not available, constant pulse-rate unidirectional scanning provides a simple and effective alternative means whereby a very large improvement in quality relative to that available by conventional bidirectional scanning may be achieved in the same total scan time.

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REFERENCES

1. SEAR R, DEAN PM: Unidirectional vs bidirectional scanning. *J Nucl Med* 12: 768–769, 1971

2. SIMMONS GH, HUNKAR DE, KEREIAKES JG: A digital ratemeter system for rectilinear scanning. *J Nucl Med* 11: 610–612, 1970

3. SEAR R, DEAN PM: A digital ratemeter system for rectilinear scanning *J Nucl Med* 12: 320, 1971

DATA RETRIEVAL SYSTEM FOR RECALLING INTERESTING SCANS

As a nuclear medicine department expands, the ability to recall that interesting brain scan with the "doughnut" lesion seen last week becomes more difficult. Do you, as we have, anticipate reviewing all lung perfusion scans exhibiting the "fissure sign" during the past three months? This becomes a tedious task. Our data retrieval system alleviates many of these problems.

Our system uses punch cards (Fig. 1). At the present time, we know of only two suppliers. These cards are available in standard index card sizes and therefore vary in the quantity of data storage. We

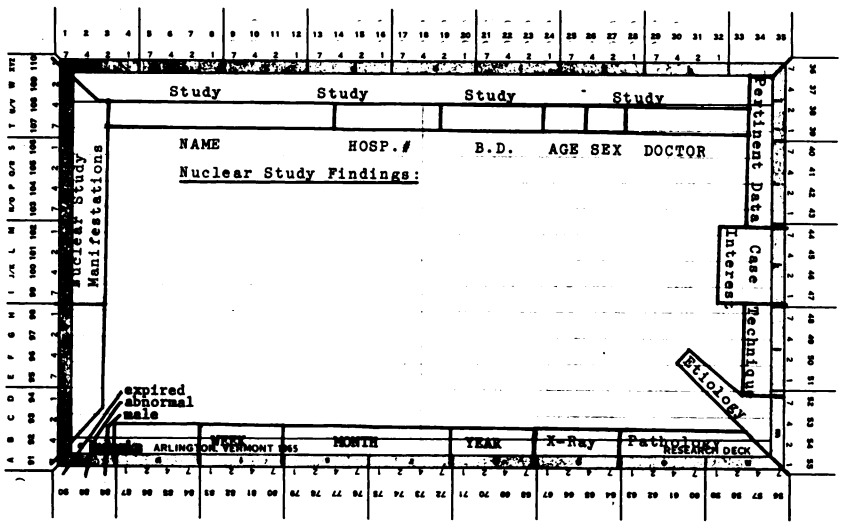

FIG. 1. Punch cards used are 5 × 8-in. and store up to 2 × 10^{20} bits of information.