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A Simple Method for the Improvement of Scanning Images

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In recent years a great effort has been made by many workers to use computers for the improvement of scanning images. It would appear from examination of the accompanying scans, that using the primitive technique of reproducing x-ray pictures is much cheaper, and is comparable with the computer technique.

METHOD

A 14″ × 17″ Kodak Industrial x-ray film, type M, is placed on a smooth surface in a darkroom. The original photoscan is superimposed on this film, and then both covered with a 15″ × 18″ glass plate, one-fourth inch thick, and exposed to an incadescent bulb for a very short period of time, 0.5-2.0 seconds. The exposed film is developed and a *negative* picture is obtained. The contrast on this film is proportional to exposure time. If one prefers a *positive picture,* this step can be repeated, using the *negative* for the original. This type of film has two advantages: (a) it is a slow film, thus not critically dependent on the amount of light it is exposed to; and (b) after developing, the nonexposed areas are almost totally transparent in contrast to the gray background we normally see on medical x-ray films.

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RESULTS

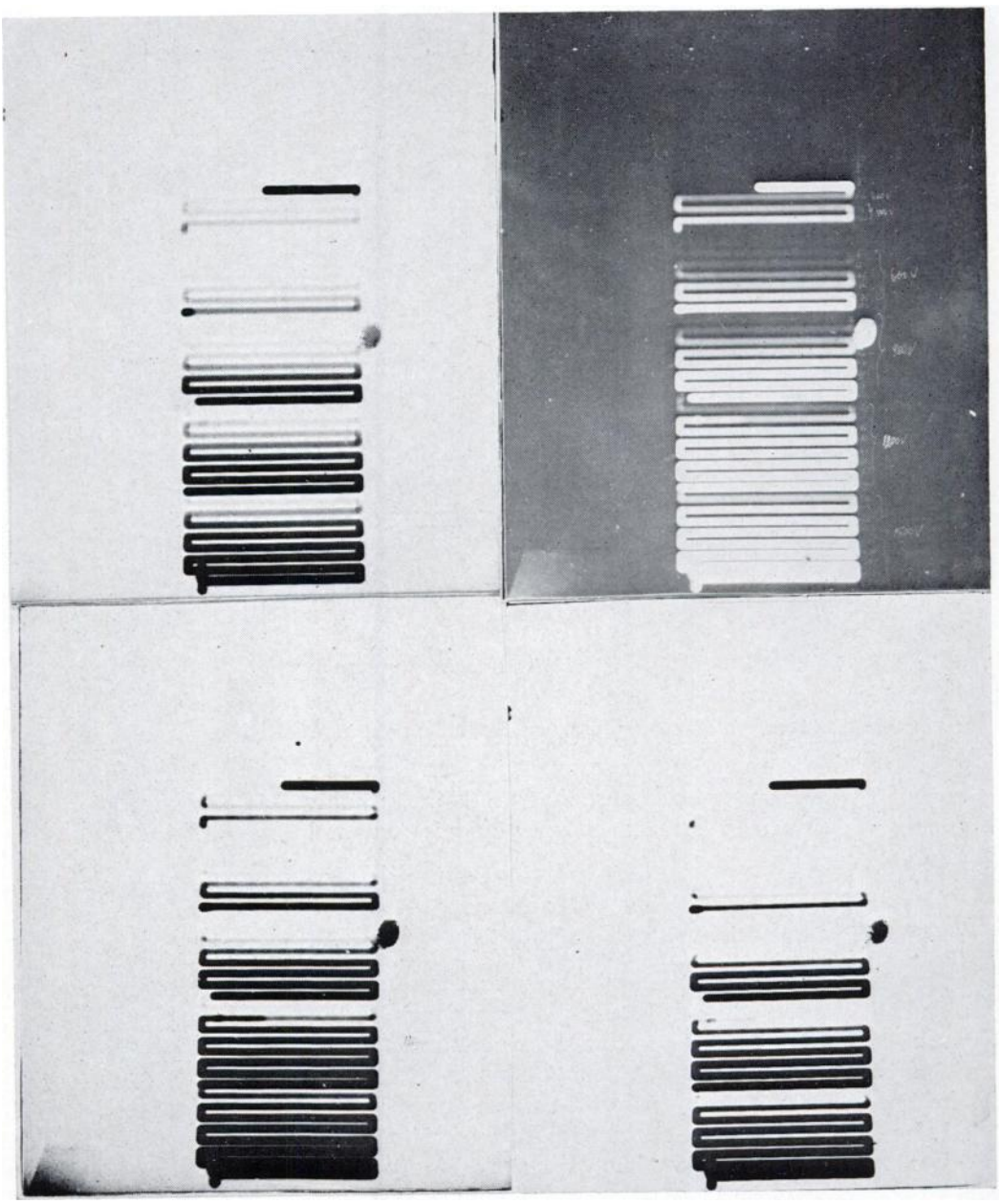

Fig. 1. (a) upper left, (b) upper right, (c) lower left, (d) lower right.

Fig. 1a: Typical calibration pattern, covering entire range of densities visible on film.

1b: *Negative* reproduction of 1a, but lower densities are enhanced.

1c: *Positive* reproduction of 1a, *via* 1b, long exposure time. Lines are darker.

1d: "As 1c", but short exposure time. Contrast is increased, low densities are not visible, high densities enhanced.

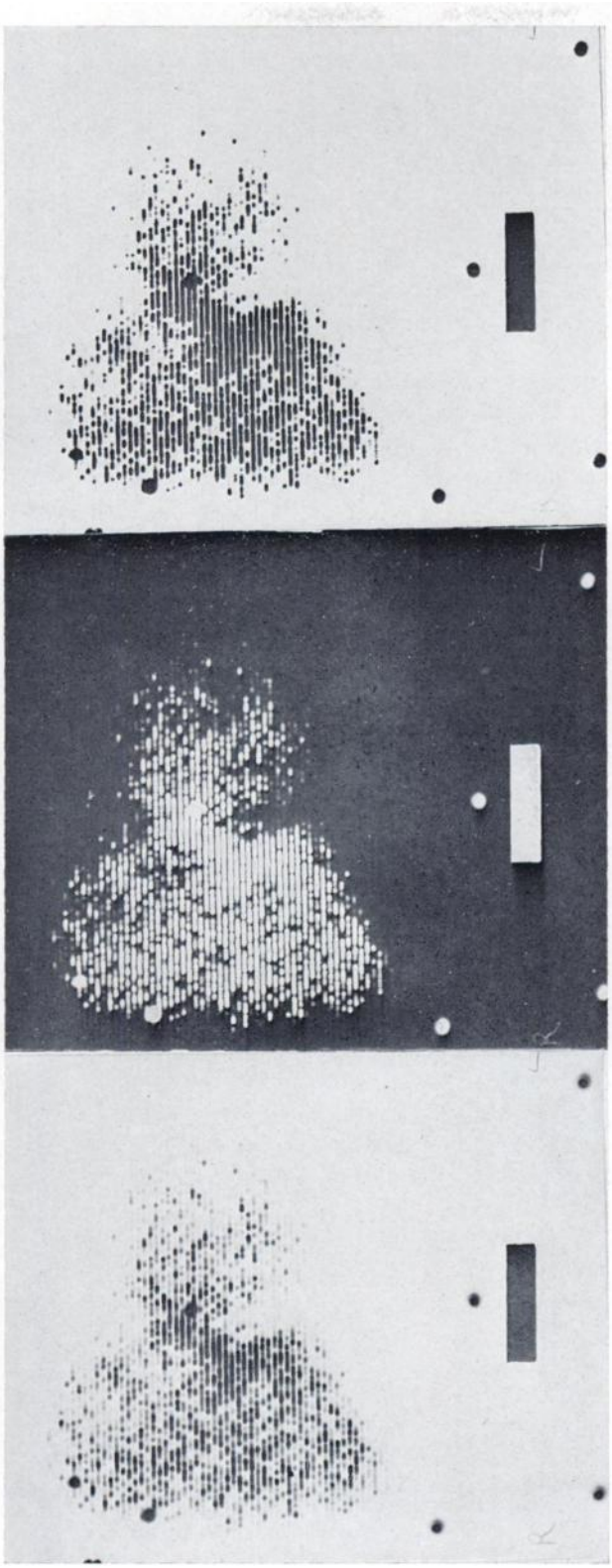

Fig. 2. (a-c) left to right.

Fig. 2a: Original liver scan.
2b: *Negative* reproduction: Points which are almost invisible on 2a appear clearly here.
2c: *Positive* reproduction: Note marked increase in contrast.

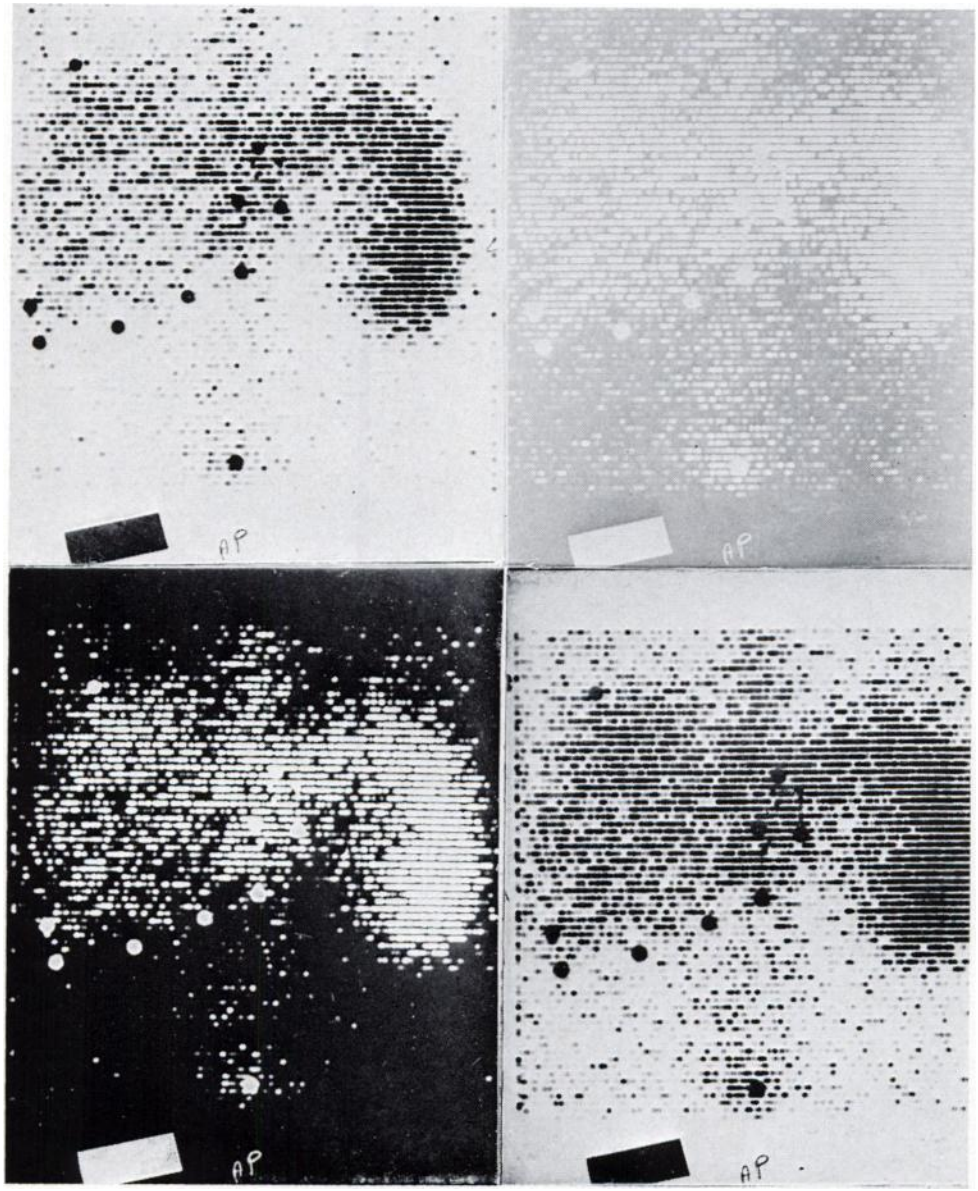

Fig. 3. (a) upper left, (b) upper right, (c) lower left, (d) lower right.

Fig. 3a: Liver scan with gold-198. Original.
3b: *Negative* reproduction, short exposure.
3c: *Negative* reproduction, long exposure.
3d: *Positive* reproduction, from 3b. Note clear delineation of bone marrow, cold spots in liver, and activity distribution in spleen.

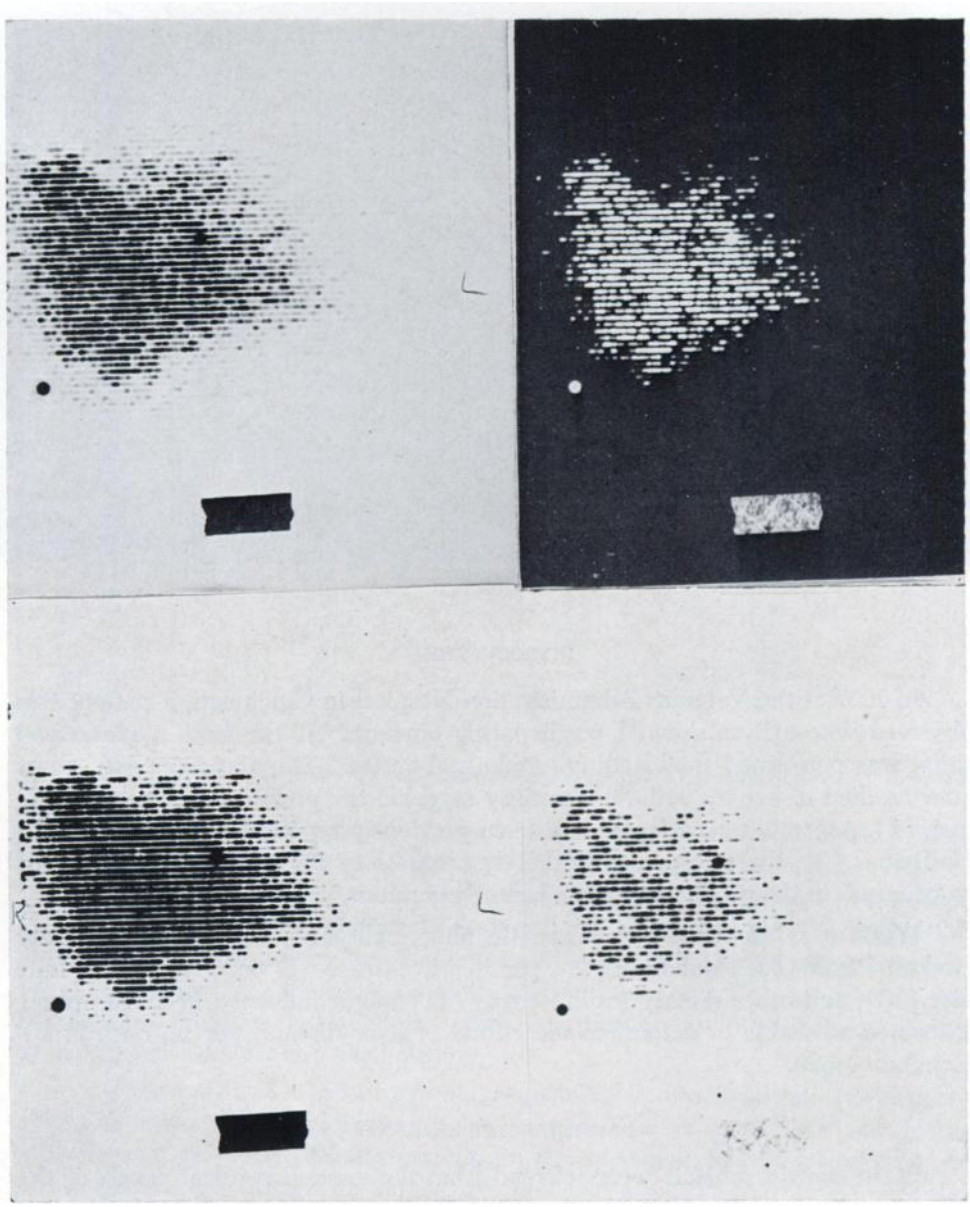

Fig. 4. (a) upper left, (b) upper right, (c) lower left, (d) lower right.

Fig. 4a: Original liver scan.
4b: *Negative* reproduction.
4c: *Positive* reproduction. Increased density.
4d: *Positive* reproduction, high background cut-off.

SUMMARY

A simple low cost method is proposed for image improvement, which can be used by any clinician, without investment in equipment, at the cost of approximately 70 cents per reproduction, the cost of the film. The results appear comparable with those obtained with computers.