MICROPHOTOGRAMMETRICAL EXAMINATION OF THE SURFACES OF TOOTH-FILLINGS

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THE method of microphotogrammetry has been extensively treated in my *Textbook of Photogrammetry*,* so it is superfluous to describe it here. Also its different uses are indicated there. These have since then been extended to the examination of surfaces of various materials, and, of late, also for the determination of topographical changes of the surfaces of tooth-fillings. As this method was the only successful one in this case we may be allowed to report about this kind of use.

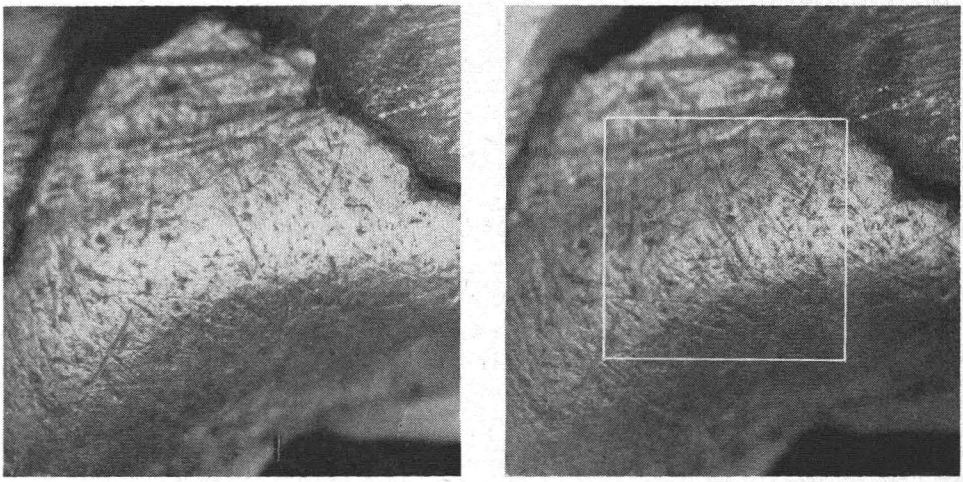

FIG. 1. Surface of a tooth filling. Mechanical wear is obvious.

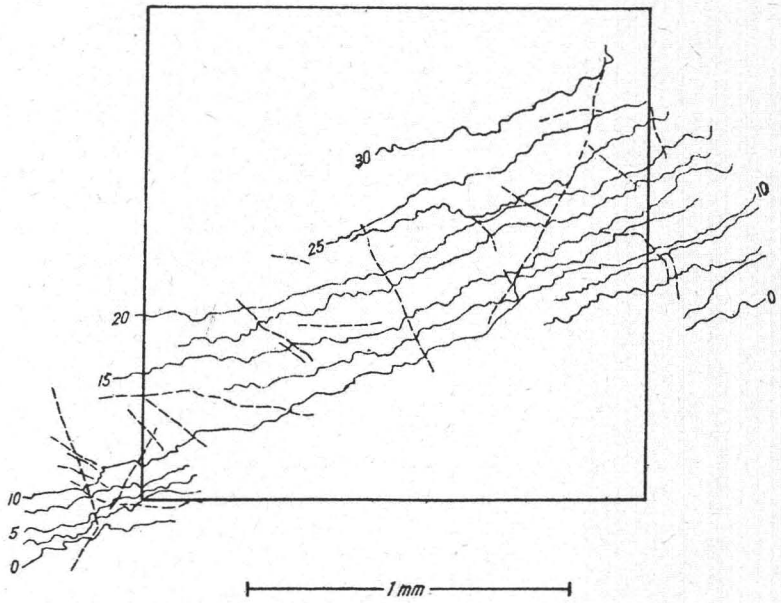

FIG. 2. Surface of a tooth filling. See Fig. 1. Mechanical wear is obvious.

* Published by H. K. Lewis and Co. Ltd., London.

In his thesis about "Oberflächenkorrosion und Pulpabeeinflussung selbst-härtender Kunststoffe" (University of Zurich, 1953), Dr. Robert Gisler inspected the reaction of different artificial materials and thereby answered the following questions:

1. Do the artificial materials used resist the influences of the mouth or are they corroded?
2. Is there any difference between the reaction of polished and unpolished fillings?

Furthermore, the reaction of surfaces of

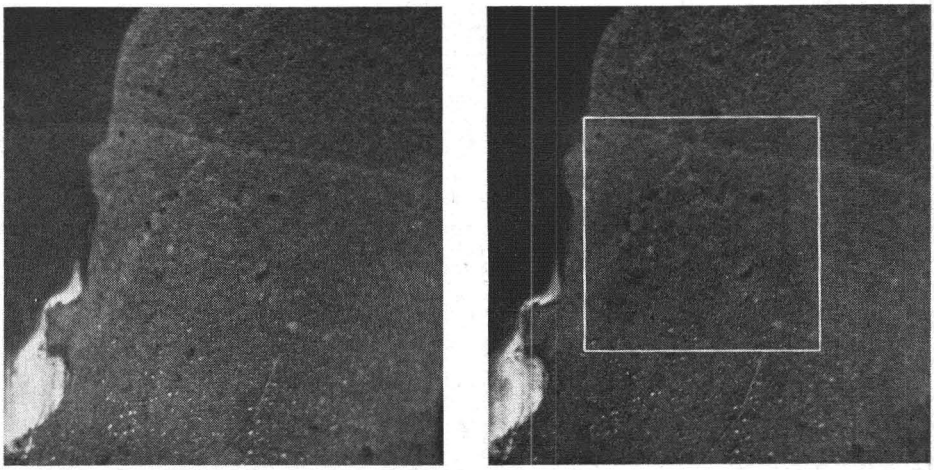

FIG. 3. Surface of a tooth filling. Chemical corrosion can be proved.

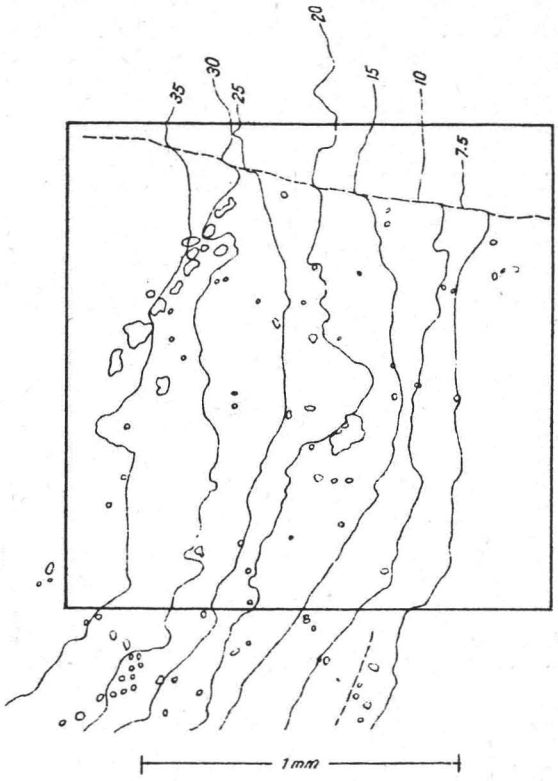

FIG. 4. Surface of a tooth filling. See Fig. 3. Chemical corrosion can be proved.

fillings of artificial material was compared with that of silicate-cement.

It has been shown that the method of adhesion-relief by Jan Wolf (Prague), known since 1939, could not be used because the substance needed for the cast dissolves any artificial material. Other experiments with casts of gelatine and paraffine were not satisfactory owing to their strong deformation. On the other hand the corroding reaction could be proved without any doubt by using the method of microphotogrammetry.

The apparatus for microphotographs, described in the above mentioned *Textbook of Photogrammetry*, was not suited for these examinations, so it was not possible to obtain an illumination of the objects without any reflections. The stereophotographs were, therefore, taken by the Photographic Institute of the Swiss Federal Institute of Technology, by using a table-camera with vertical axis (Fusskammer) with moveable table (Objective Gly-Busch, f = 25 mm., diaphragm 1:18).

The tooth experimented on was embedded into plastiline on the horizontal cross-sledge (Kreuzschlitten) so that the surface of the filling was, as far as possible, in a horizontal position. The photographs were taken in two different positions with a linear magnification of 20 times whereby for the second picture the tooth was displaced by 2 mm. The illumination by a 500 Watt lamp lasted 6 minutes for each picture. By employing a dispersing-screen (Streuschirm) for the obliquely directed light, troubling reflexes from the object could be avoided.

By this arrangement on image distance of 454 mm. was obtained corresponding to an object distance of 22.7 mm. The plotting was done by my assistant Engineer Häberli at the Wild-Autograph A2 on the scale of about 40:1 (0.05 and 0.0025 mm. vertical interval respectively) according to the formulae contained in the above mentioned textbook.

The Figures 1 and 2 and 3 and 4 show the surfaces of two different tooth-fillings. In the first case the mechanical wear is obvious (relatively smooth surface, rills and craters of various shapes), while in the second case the chemical corrosion (granulated surface with little holes caused by dropping of single pearls of artificial material) can be proved.

Even though the two pairs of stereophotographs already show distinctly the difference in the topographic character of the filling surfaces, the topographical plotting was asked for as a proof of this structural differences.

Figure 2 shows that, in this case, only a relatively small strip could be plotted because, owing to the uneven surface, the adjacent parts had not been sharply pictured. This relatively small plotting surface was, however, quite sufficient to control the nature of the surface, since the finer the structure the smaller the surface to be examined can be chosen.

As in former experiments it was also shown here that the illumination of the object and the sharpness of the picture are of decisive importance. However, in a photographical laboratory these conditions can easily be fulfilled.