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POLICE MICROSCOPY

ALBERT SCHNEIDER¹

The use of the compound microscope in criminal investigation is not entirely new. From time to time scientific investigators who use the microscope, as botanists, cytologists, bacteriologists, embryologists, workers in clinical laboratories, and others, have been called upon to assist the investigating officers in unraveling criminal problems, and in most instances their efforts have been of great value, not merely in finding evidence, but also in disclosing to those interested in criminology a new line of attack on crime. Interesting cases of detection of crime by means of the microscope are reported by Gross and other eminent students of criminology. Isolated cases are reported from Austria, from Italy, from France and a few from the United States.

The reasons why the compound microscope is not more generally employed in criminal investigation are as follows:

1. The investigating officer does not know when the assistance of the expert microanalyst may be of value, nor does he know what material should be submitted for such examination, nor does he know where the expert is to be found.
2. When the material is finally submitted to the expert in the use of the microscope, it has passed through so many hands as to make the findings of little value.
3. The expert to whom the material is submitted not being a criminologist, is as a rule unable to give a rational interpretation of the findings. The investigating officer who submitted the material cannot assist the microanalyst in deducing the correct interpretation of the findings because he knows nothing about the significance of the findings of the specialist.

The difficulties or defects indicated may be corrected as follows: Give the investigating officers sufficient training in police microscopy to enable them to decide quickly when the services of an expert may be required. This does not mean that these men themselves must be expert microanalysts. A mere introduction to such work would suffice. In the Berkeley School for Police Officers every member of the class of those who enter upon the full three years' course receive careful instruction in the use of the compound microscope and are required to examine papers, fibers of all kinds (including human hair

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and the hair of many different animals), blood stains, other stains, smears, deposits of all kinds; finger-nail deposits are emphasized and also the examination of dust, stains, smears in and upon clothing, hats, wrappings, etc. The time devoted to the work does not make experts of them, but it does enable them to appreciate the value and significance of such work. The second important requirement in the correction of the defects above stated is the appointment of trained police microanalysts in every large police center; and, quite naturally, the question arises, what is a trained police microanalyst? A properly trained police microanalyst must have a very thorough scientific education including a complete survey of plant and animal histology, bacteriology (microbiology), microscopy of foods and drugs, and the microscopical examination of soils and minerals. No man, even with the best opportunities, could hope to complete the preparatory training as above indicated under thirty years of age, and he must have in addition much practical experience in food and drug work, in clinical work, in the examination of textile fabrics, etc., so that he would be not less than forty years of age before he could assume the responsible work which would fall to him. There are today not more than six or seven such qualified police microanalysts in the civilized world. There are perhaps two or three in the United States. But small as the number is, these specialists should be employed in the highly important work for which they are so peculiarly fitted, and they should be given every facility to continue the work which they have begun and they should be set to work training a new and larger generation of similar experts.

It may not be absolutely essential that the police microanalyst should be a master in all of the sciences in which the microscope is now regularly employed, but he must know very definitely when a specialist should be consulted, and he should assist the specialist in making the correct interpretation of the findings. The following carefully selected cases will serve to indicate the necessary training of the police microanalyst in order that he may do good work:

1. *Sex Crime.* Young married man of twenty-two was accused of having been sexually intimate with a girl of five years. The microscopical examination proved that the child was suffering from a very severe attack of gonorrhoea and that young man was afflicted with chronic gonorrhoea. In this case clinical expertness was required. As a preparation, a course in bacteriology and pathology would be necessary.

2. *Attempted Rape.* Man of thirty attempted rape upon a girl of nine. The most careful examination of the clothing of the child showed total absence of seminal stains, this negative finding coupled with the

story of the child indicated that the man was a paranoid with signs of pre-senile mental degeneration. Clinical expertness and a knowledge of mental diseases constituted a necessary preparation to analyze this case.

3. *Tong Murder Suspect.* Young Chinaman arrested on suspicion of having committed a tong murder stated that he was a cook's helper by occupation. The microscopical examination of the stains and smears upon his clothing proved that this part of his testimony was the truth. The microscopical findings further showed that the susepect had spent some time in the surrounding country and that he had been in company with a young white woman. This case called for expertness in the recognition of food particles, of plant tissues and of hair.

4. *Horse Poisoning Case.* Man was accused of having poisoned a horse by giving him phosphorus in alfalfa. The microscopical examination of the stomach contents of the dead animal showed no trace of alfalfa which proved that the charge was not based on fact. Expertness in the recognition of forage crop tissue was required.

5. *Sheep Poisoning Case.* Over 260 head of sheep died in the stock yards of a large city with all of the symptoms of acute poisoning. The most careful chemical examination on the part of the toxicologist proved the absence of all of the known chemical poisons. The microscopical examination showed the absence of poisonous plants, but the stomach contained abundant microscopic organisms belonging to the yeast group (*Saccharomycetes*), showing a most interesting life history. Inoculation tests with young rabbits and guinea pigs proved that this organism caused the death of the experimental animals and that it was in all probability the cause of the death of the sheep in question. Further tests showed that the spores of the toxic yeast organism reached the animals through the barley screenings with which they were fed. As soon as this food was discontinued no further deaths were reported. This was a most interesting case in many ways and called for expertness in the examination of microorganisms, a knowledge of the natural flora of the intestinal tract of sheep and of other animals, of poisonous plants generally, including an ability to make new and original observations. Even the specialists in the study of the yeast organisms who were consulted were unable to give assistance and the police microanalyst was compelled to conduct the original tests and experiments himself.

6. *Burglary Case.* A blue woolen shirt left by the burglar at the seat of his crime. Three hairs were found upon the shirt. The examination of the hair and shirt enabled the police microanalyst to formulate the following deductions: That the burglar was a young man of about twenty, about 5 ft. 8 in. tall, weighing about 170 lbs., hair dark brown, eyes probably blue, smooth shaven, fairly neat in appearance and fairly cleanly in habits. When the burglar was apprehended it was found that the above description tallied almost exactly.

7. *The Spy Suspect Case.* Vacuum sweeper cleaning material was submitted to the police microanalyst with the request that he report as to the occupants of the room from which the material was obtained. The following is the list of the findings:

- a. Hair of rabbit, colored gray (from soft gray felt hat).
- b. Wool fiber, colored gray (from gray woolen suit).

- c. Beard trimmings. Head hair.
- d. Pollen grains of different plants. Spores and some mold.
- e. Sand and clay articles. Soil particles.
- f. Newspaper and book paper fiber fragments.
- g. Fiber elements derived from cheap rugs.

The microanalyst submitted the following report based upon the interpretation of the above findings: "That the room from which the sweeper material was obtained had been occupied by a man of about seventy, spare built, gray beard trimmed Van Dyke style, hair gray (originally of reddish blond color), and straight and rather fine; neat in appearance and cleanly in habits; dressed in gray woolen suit with soft gray felt hat. That he was an amateur botanist making foot excursions into the surrounding country, that he was studiously inclined and of gentlemanly as well as of scholarly appearance, that he was much to himself, almost a recluse." The man was finally located and proved to be an American citizen of North European origin, retired from business and was spending a very modest income in study and other mental recreation. This case serves to indicate the significance of what is meant by "interpreting the findings." Not only is it necessary to be able to recognize and identify the particles seen under the microscope, but the significance of the findings must be rationally and intelligently interpreted. In this regard the work is similar to that of the physician when he makes a diagnosis of a case based upon a study of the symptoms.

8. *Vomit Smear Case.* The following case, though not criminal in nature, is of special interest because of its complexity and also because it illustrates to a remarkable degree the importance of good judgment in making the interpretation and conclusions. A physician submitted a bit of newspaper upon which was a vomit smear, with a request that the microanalyst tell the entire history of the stain.

The following is the list of the findings:

- a. Normal contents of the stomach (undigested and partially digested food particles, etc.).
- b. Starch granules and bast cells derived from the peeled roots of *Althaea officinalis*.
- c. Papillose epidermal elements of the petals of the red rose.
- d. Globules of metallic mercury.
- e. Chalk particles.
- f. Pollen grains (very few).
- g. Abundant crystals of basic mercuris sulphate, known as turpeth mineral.
- h. Crystals of calomel.
- i. The starch granules, yellow lignified elements and the crystals bearing fibres derived from *Glycyrrhiza glabra*.
- j. Paper fiber, etc.

The conclusion reached was that the substance found in the vomit smear was a medicinal compound containing the following U. S. P. preparations:

- a. Confection of Rose U. S. P. (indicated by (c) and (f)).
- b. Blue Mass U. S. P. (indicated by (d) and (e)).
- c. Gray Powder U. S. P. (indicated by (d), (e) and (f)).

To this was added turpeth mineral. At the request of the physician a formula was written and ordered prepared according to the above findings at a drug store. The microscopical examination of the preparation checked with the findings of the vomit smear.

9. *Coin Smear Case.* The examination of a black smear upon a silver coin revealed corn starch, vegetable extract, dark dull blue and sunfaded bacterially contaminated cotton fibers, and two fragments of body hair. The conclusion reached was that the smear was derived from a belladonna plaster worn by a white laborer of middle age and of unsanitary habits.

10. *Railway Dynamiting Case.* Two sticks of dynamite were placed on the railway track in a tunnel with intent to wreck a passenger train. The dynamite exploded when hit by the engine, without, however, doing serious damage. A bit of coat lining found at the place of the explosion showed microscopic evidence that the wearer was a middle aged man of light complexion who had been engaged in a mine and who had spent much time in the open in the forests, some of his meals being prepared from ready mixed pancake flour.

The compound microscope would prove of great value in the secret service, as in the examination of letters, documents of all kinds, etc. There is evidence that some of the European armies have employed expert microanalysts in the examination of spy suspects. Time does not permit entering into a discussion of the possibilities along these lines. In addition to the special preparation, training and experience required to do efficient work in police microanalysis, those engaged in this work must be absolutely honest, mentally and morally fearless, entirely free from bias, and free from emotional imagination. He must have imagination indeed, but it must be of the scientific kind and it must be balanced and controlled by good judgment and sound reasoning. He must be an all around student of human nature.

It is not possible in so brief a report to discuss a subject of such vital importance in criminal investigation and which is so firmly rooted in biological sciences. It is hoped, however, that the examples cited will serve to indicate the practical possibilities in police microscopy.