diate and the other as ordinary projection lens.

In this apparatus, an intermediate aperture (0.1-0.05 mm in diameter) was used between the objection and the 1st projection lens at the position of the 1st image of the specimen through the objection lens, by which we could limit the sight field of the object, and when the focal lengh of the intermediate lens was changed, the diffraction pattern of the very portion of the specimen just limited by the aperture could easily be obtained. Those methods may be called the "Electron Microdiffraction Method".

We studied with this apparatus on many materials such as Sericite, Kaolinite, Trigon gold sol, etc.. Especially on the "Trigon" particles, we reported (this Bulletin 26 (1951) 78) many results, obtained by SM-T4, an ordinary electron microscope which has diffraction apparatus, in relation to their character, crystalline state, lattice structure and so on. The results obtained by the new method verified those obtained by older one.

The interpretation of the N-patterns that these particles had grown up towards (111) planes of the face centered cubic lattice, became reasonable. Moreover, when such crystals were very thin, many extra-spots which were forbidden for the crystals of the face centered cubic lattice appeared on the N-patterns. This might be ascribed to double reflection of the electron in the crystal, but decisive conclusion could not yet be attained.

We consider this method very convenient and reasonable, being a new weapon for the studies on micro-crystalline particles.

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14. Studies on the Shadow Microscope as an Attachment of Electron Microscope

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It is very reasonable to use electron diffraction method to identify a specimen which is under examination with the electron microscope. One of the practical methods of this idea applicable to the table type electron microscope (SM-T4), having only two electron lenses, is the shadow microscope, which gives an enlarged shadow image of the specimen cast on the fluorescent screen by a reduced point source of electron. We prepared a hollow bullet shape specimen holder, whose size is 2 cm in dia. and 5 cm in length, and then it became possible to set the specimen just behind the projection lens, keeping a distance from 3 to 10 mm between them. The migration of the specimen was carried out with the lever which was operated by the spindle of the ordinary specimen migrator of electron diffraction apparatus. A D.C. power

supply, stabilized by a vacuum tube circuit was constructed and was used to vary the focal length of the projecitve lens. The objective lens was operated to make the 1st reduced image and the projective lens to make the 2nd reduced one of electron source, and by changing the focal length of the 2nd lens, the position of the apex of electron probe could be varied on the optical axis in the space between the fluorescent screen and just the front of the specimen. When apex of the probe existed between the screen and the specimen, its shadow image was bright but suffered a severe distortion. When the apex, however, was drawn back to the position between projective lens and specimen, a sharp but not so bright image without distortion could be obtained, and the order of magnification was increased from 50 to 500. By photographic enlargement we could obtain comparatively sharp positive print, whose order of the magnification was about 1,000–3,000. When the probe position was drawn up till the screen, a diffraction pattern of the specimen could be obtained.

The shadow microscope is considered to be useful for the detection of the orientation of the lattice structure of the microcrystal, such as the gold sol particle "Trigon". (see, this Bull. **26** (1951) 78).

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15. Observation on the Dispersion State of Various Fillers in the Vulcanized Rubber by Electron Microscope

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In rubber industry, it is important to clarify the influence of those particle sizes, particle shapes and dispersion states of the reinforcer or the filler, upon the various properties, which when compounded with the natural or synthetic rubber. Hundreds electron micrographs on various inorganic fillers now being used mainly in this country were taken by the authors. Although there are numerous electron microscopic observations on the filler itself, scarcely any observation has yet been made on its dispersion state in rubber. We observed the dispersion state of some fillers and reinforcers when compounded with the vulcanized rubber, applying the combined methods of surface replica and metallic shadow casting. Those fillers as carbon black, basic magnesium carbonate, calcium carbonate and ultrafine calcinm carbonate, whose sizes and shapes had been measured by us with electron microscope, were compounded with ruber under the same condition, and they were vulcanized. The cross section of the rubber samples thus prepared, was observed with an electron microscope, and thereby good electron micrographs, showing the dis-