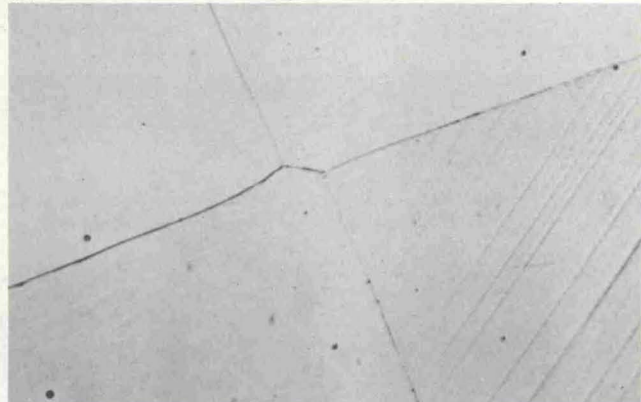
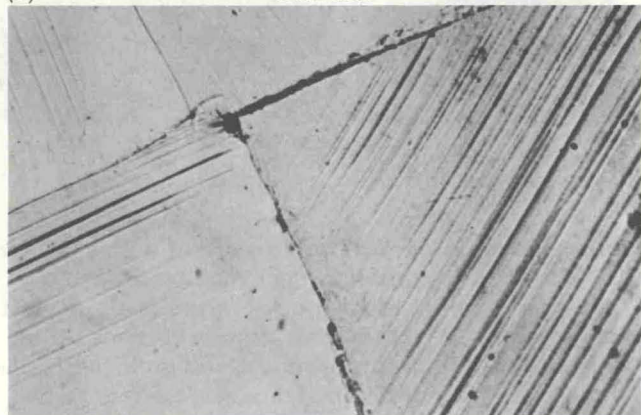


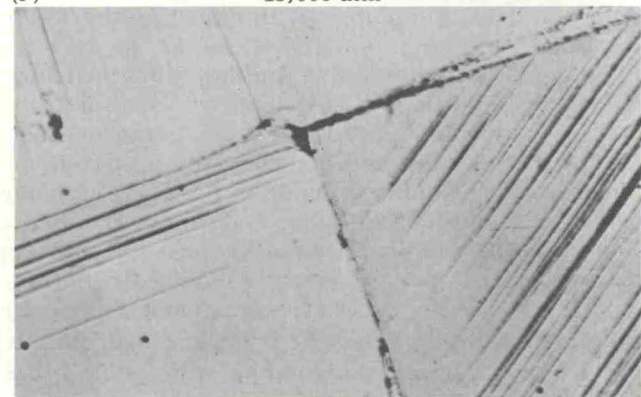
(a) 0 pressure



(b) 5000 atm

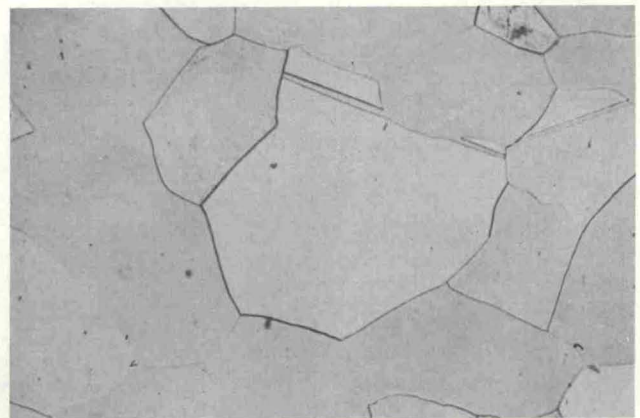


(c) 15,000 atm

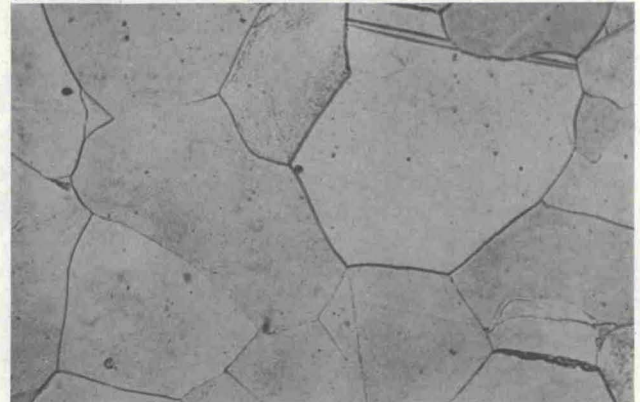


(d) 20,000 atm

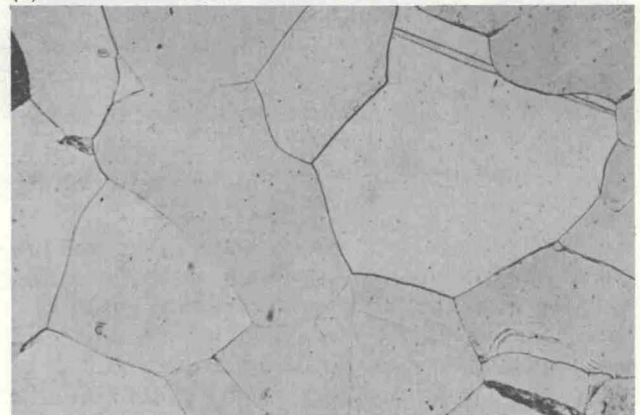
Fig. 6—Highly concentrated slip bands in conjunction with localized deformation along boundaries. X100. Enlarged approximately 4 pct for reproduction.



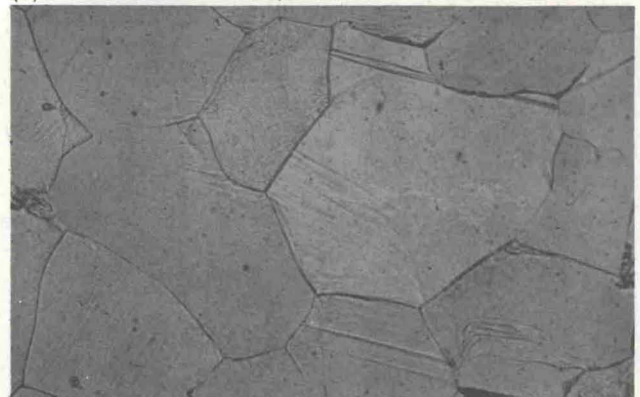
(a) 0 pressure



(b) 10,000 atm

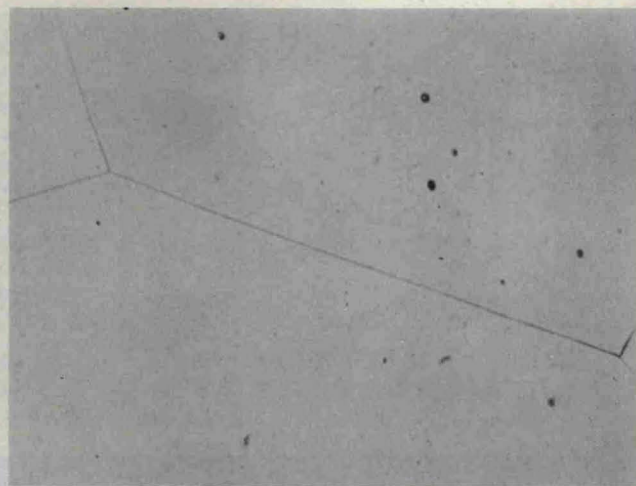


(c) 15,000 atm

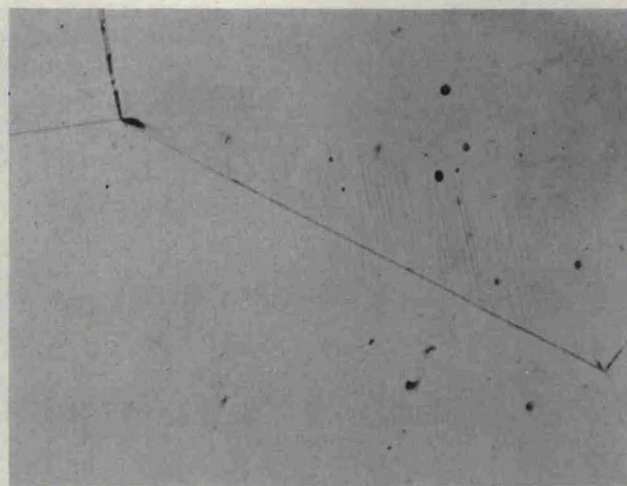


(d) 20,000 atm

Fig. 7—Typical structural change in as-extruded bismuth. X100. Enlarged approximately 2 pct for reproduction.



(a) 0 pct strain



(b) 1 pct strain



(c) 3 pct strain



(d) 5 pct strain

Fig. 8—Bismuth deformed in uniaxial compression showing preponderance of slip and cross-slip. X100. Enlarged approximately 4 pct for reproduction.

zation. To prevent distortion, the surface was prepared by electropolishing in a supersaturated KI solution with 1 pct by volume concentrated HCl. Added polishing time was approximately 4 min with a 6 v potential and moderate agitation.

Pressure System. The pressure system used in this investigation is shown schematically in Fig. 2. The system operates by precharging the main cylinder, using the precharge pump and liquid-gas cylinder, to a pressure of approximately 2000 atm. The pressure is further built up by driving the piston into the cylinder using the upper jack as shown in Fig. 1. As the piston moves, it passes the precharge port, thus preventing high pressures from entering the precharge system. The high-pressure piston, which is schematically shown, is of the unsupported area type, using brass wedge rings against the cylinder wall.

In order to keep the main cylinder in triaxial compression simultaneous with the build-up of pressure, it is forced into a tapered jacket by means of the lower jack. With this arrangement, the system has a capacity of 30,000 atm.

Pressure measurement is by means of a manganin

coil mounted in the bottom closure as also shown in Fig. 1. The pressure was recorded by a Foxboro recorder mounted on the control panel. Although it was not used in this investigation, a furnace, along with three thermocouples, can also be placed inside of the main cylinder. The leads for the manganin cell, along with those for the furnace and thermocouples, enter the main cylinder through the bottom closure.

This pressure system is similar to that used by Bridgman³ and Birch and Robertson,⁴ and further details may be obtained from subject references.

For testing, the metallographically prepared specimens were placed inside of a holding cylinder in order to enhance handling, and this cylinder placed in the main cylinder of the pressure device. Extreme care was necessary in the handling of the specimen in order to prevent accidental deformation. In all pressure runs, single crystal control samples were simultaneously tested along with the polycrystalline samples to insure that there were no extraneous nonhydrostatic stress components. The pressure was held at each of the investigated levels of 5000, 10,000, 15,000, and 20,000 atm for 1/2 hr.