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Nabarro F R N, Basinski Z S & Holt D B. The plasticity of pure single crystals. *Advan. Phys.* **13**:193-323, 1964.
[University of the Witwatersrand, Johannesburg, South Africa; National Research Council, Ottawa, Canada; and Imperial College, London, England]

The existing experimental evidence on the work-hardening of pure single crystals was summarized, and existing theories were correlated. The greatest value of the review lay in this simultaneous consideration of experiment and theory. [The *SCI*® indicates that this paper has been cited in over 235 publications.]

F.R.N. Nabarro
University of the Witwatersrand
Johannesburg 2001, South Africa

Z.S. Basinski
National Research Council
Ottawa, Ontario, Canada

D.B. Holt
Imperial College London
London, England

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When a metal single crystal is extended plastically, the force required to extend it steadily increases. We know that the plastic extension occurs by the motion of dislocations and that these dislocations multiply and impede each others' motion. As they accumulate, the dislocations form well ordered patterns within the previously homogeneous crystal. There have been many attempts to explain this process of work-hardening, starting with the classical paper of G.I. Taylor[1] and the pioneering work of N.F. Mott[2,3] and A.H. Cottrell.[4] At the time of the review, the subject was very popular, and there was a surfeit rather than a lack of theoretical contributions and experimental measurements.

Ideally, a theory should predict the form and scale of the dislocation structure, the plastic strain that is produced during its formation, and the stress required to develop the structure further. The success of existing theories has been modest. This is partly because it is a "several-body problem," with too many dislocations for their motions to be followed individually and too few for statistical methods to be applicable, and partly because the theory of "dissipative structures" is only now beginning to be understood. As a result, theoretical approaches have to rely heavily on experimental observations. To further complicate the situation, experimental observations are not always what they seem to be. Mechanical properties are affected by a wide variety of parameters both of the material (e.g., purity, perfection) and of the equipment. There was a great deal of apparent disagreement in the published experimental data and also in the interpretation of data.

The authors felt that they were a good team to review the state of the subject. While we hoped that the review would be useful to others, we prepared it very largely for our own use. The team consisted of Nabarro (a theoretician with a strong interest in experiment), Basinski (an experimentalist with a strong interest in theory), and Holt (a younger man with whom Nabarro had worked and who was an enthusiastic reader of the published works). Our weakness as a team was that we were spread over three continents. Despite this, the review took only a few months to prepare. A Russian translation was published as a paperback volume by the Metallurgia Publishing House, Moscow, in 1967.[5]

Since the review was written, we have each extended and revised its ideas in accordance with our own interests. Holt has studied the properties of dislocations in semiconductors.[6,7] Basinski, with his wife, has critically reviewed and updated the experimental evidence, especially on copper.[8] Nabarro has recently attempted a new theoretical synthesis.[9] Much refined experimental evidence has been accumulated in recent years and the theoretical ideas have become better understood. The time is probably ripe for a new survey.

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2. **Mott N F.** A theory of work-hardening of metal crystals. *Phil. Mag.* 43:1151-78, 1952. (Cited 245 times since 1955.)
3. --------------, A theory of work-hardening of metals. II: Flow without slip-lines, recovery and creep. *Phil. Mag.* 44:742-65, 1953. (Cited 180 times since 1955.)
4. **Cottrell A H.** *Dislocations and plastic flow in crystals.* Oxford: Clarendon Press, 1956. 223 p.
5. **Nabarro F R N, Basinski Z S & Holt D B.** *Plasticity of pure single crystals.* Moscow: Metallurgia Publishing House, 1967. (Cited 50 times.)
6. **Holt D B & Lesniak M.** Recent developments in electrical microcharacterization using the charge collecting mode of the scanning electron microscope. *Scanning Electron Microscopy* **1**:67-86, 1985.
7. **Yacobi B G & Holt D B.** Cathodoluminescence scanning electron microscopy of semiconductors (review). *J. Appl. Phys.* 59, 1986. (In press.)
8. **Basinski S J & Basinski Z S.** Plastic deformation and work hardening. (Nabarro F R N, ed.) *Dislocations in solids. Volume 4. Dislocations in metallurgy.* Amsterdam: North-Holland, 1979. p. 261-362.
9. **Nabarro F R N.** Work hardening of face-centre cubic single crystals. (McQueen H J, Bailon J-P, Dickson J I, Jonas J J & Akben M G, eds.) *Strength of metals and alloys.* Oxford: Pergamon Press, 1986. Vol. 3. (In press.)

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