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This Week's Citation Classic

Hirth J P & Lothe J. *Theory of dislocations.* New York: McGraw-Hill, 1968. 780 p.
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Parts 1 and 2 of this book consider the fundamental aspects of dislocation theory, including isotropic and anisotropic elastic theory of dislocation lines and segments, lattice periodicity effects, stacking faults and partial dislocations, and defects in ionic crystals. Parts 3 and 4 include both fundamentals and applications. Topics include motion of dislocations at high temperature by interaction with vacancies, interactions with solute atoms, the geometry of grain boundaries, dislocation sources and pileups and twinning dislocations. [The *SCI*® indicates that this book has been cited over 1,040 times since 1968.]

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"Our book on dislocations was conceived while both Jens Lothe and I were postdoctorate fellows at the University of Bristol. At that time my background was in the kinetics of nucleation and growth while Lothe's was in theoretical physics. We were attending lectures on dislocation theory by F.C. Frank and developed the idea of applying nucleation and growth kinetics to the motion of dislocations across the Peierls periodic lattice barrier. As this work[1] was completed, we became so fascinated with dislocations that we tentatively agreed to collaborate on a book on the subject.

"I returned to Carnegie Institute of Technology and then moved to Ohio State University in 1961, while Lothe returned to Oslo University except for a year as visiting professor at Carnegie Tech. Both of us taught graduate courses on dislocation theory during that period. Finally, we were ready to write and completed most of the draft manuscript during the summer of 1964, which I spent in Oslo. The most untoward event that summer was that I not only worked 12 hours a day on the book, but stayed awake reading late at night, getting only one hour or so of sleep for a period of two weeks. I first thought it was the extended daylight that was causing it. However, with an exclamation of alarm, one morning Lothe informed me that I was drinking not coffee but the concentrate from which coffee was made! I had been doing this for two weeks at our morning coffee break. I did think the flavor was a bit odd.

"There was a spate of activity in dislocation theory in the 1940s. The basic theory was covered in the early books on the subject. A new burst of activity in the field had developed in the mid-1950s with the advent of direct observation of dislocations by transmission electron microscopy.[2-3] Our book appeared at just about the optimum time in covering these new developments, which probably accounts for many of the citations. Also, we attempted to give a very complete treatment of the mathematical theory of the defects, so the book is often cited as a source for a formula.

"There have been a few new developments in the field in recent years, as indicated by the proceedings of a recent conference.[4] These have been incorporated in a new edition of our book."[5]

1. **Lothe J & Hirth J P.** Dislocation dynamics at low temperatures. *Phys. Rev.* **115**:543-50, 1959.
2. **Hirsch P B, Horne R W & Whelan M J.** Direct observations of the arrangement and motion of dislocations in aluminium. *Phil. Mag.* **1**:677-84, 1956.
3. **Bollmann W.** Interference effects in the electron microscopy of thin crystal foils. *Phys. Rev.* **103**:1588-97, 1956.
4. **Hartley C S, Ashby M F, Bullough R & Hirth J P, eds.** *Dislocation modeling of physical systems*. Oxford: Pergamon Press, 1981. 525 p.
5. **Hirth J P & Lothe J.** *Theory of dislocations.* New York: Wiley. In press, 1981.