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This Week's Citation Classic

Dillamore I L & Roberts W T. Rolling textures in f.c.c. and b.c.c. metals. *Acta Metallurgica* 12:281-93, 1964. [Dept. Industrial Metallurgy, Univ. Birmingham, England]

A theory was developed to account for rolling textures in cubic metals. The stress system was taken as biaxial, and a simplified model for crystal slip was adopted. The brass texture was due to planar slip, while the pure metal texture was a consequence of cross-slip. [The *SCI*® indicates that this paper has been cited over 125 times since 1964.]

I.L. Dillamore
Department of Metallurgy and
Materials Engineering
University of Aston Gosta
Green, Birmingham B4 7ET
and
W.T. Roberts
Department *of* Industrial Metallurgy
University of Birmingham
Birmingham B15 2TT
England

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"A *Citation Classic!.* How can one refuse to tell the world about the flowering *of* genius that gave birth to a *Citation Classic?* But what do we say if we have for some years had a mild feeling of embarrassment every time we have seen it cited.

"It's not that it was a bad paper in its time but, truth to tell, its time was really quite short. It would be nice to be able to say that the work is cited because of a sense *of* culture in the community that has an interest in such work, but it is sadly nearer to the truth that there is a section of the community that is stuck in the narrow window in time when the paper had its day.

"It was for a short time an important paper because it sharpened a debate between two extreme views. The senior German worker in the field of textures in metals, Günter Wassermann, had put forward an explanation of a phenomenon that had attracted the interest of solid-state physicists and metallurgists for 20 years previously, namely, why pure face centred cubic metals developed deformation textures different from many of their alloys (e.g., brass).[1] Wassermann proposed that mechanical twinning caused the pure metal texture to transform into the brass texture. This view had the major problem that twinning was not widely believed to be an important deformation mechanism in f.c.c. metals and Wassermann could not explain how the pure metal texture formed in the first place. The *Citation Classic* gave an alternative view. It accepted the then conventional wisdom that the brass texture was the texture that should form in f.c.c. metals and deduced that cross-slip — which was very much in vogue as a controlling mechanism for the deformation of fee. metals — could cause this texture to transform into the pure metal texture. That Wassermann was more nearly right and the *Citation Classic* was wrong became clear with the widespread availability of computers which allowed the crystal rotations during deformation to be calculated using a more realistic model for crystal deformation than that used in our paper.

"The currently accepted model for polycrystalline plasticity is based on the original ideas of Taylor, and the more convenient analysis of Bishop and Hill.[2] Application of this model to the problem of texture prediction was outlined in an early paper by Bishop,[3] but ambiguities in rotation paths arose because of some freedom in choice of the operative slip systems. An important contribution was made by Butler, Green, and me,[4] when we showed that, for a wide range of initial orientations, the ambiguities arising from the straightforward application of the Bishop and Hill method could be removed, and we demonstrated that the pure metal texture is indeed the expected texture. Belief in twinning as *an* important deformation mode in f.c.c. metals is still not widespread but it certainly is important in low stacking fault energy alloys.

"The reason why the paper is so often cited may be that it was never duplicated. The paper by Butler, Green, and me[4] has been copied, repeated, and worked over with bigger and better computer programmes in many later publications. It will probably not become a *Citation Classic* because too many workers would rather forget its priority."

1. **Wassermann** G. Der Einfluss mechanischer Zwillingsbildung auf die Enstehung der Walztexturen kubisch flächenzentrierter Metalle. Z. *Metallk.* 54:61-5, 1963.
2. **Bishop J F W & Hill R.** A theory of the plastic distortion of a polycrystalline aggregate under combined stresses. *Phil. Mag.* 42:414-27, 1951.
3. **Bishop J** F W. A theory of the tensile and compressive textures of face-centred cubic metals. *J. Mech. Phys. Solids* 3:130-42. 1954.
4. **Dillamore I L, Butler** E & Green D. Crystal rotations under conditions of imposed strain and the influence of twinning and cross-slip. *Metals Sci. J.* 2:161-7, 1968.