

This Week's Citation Classic

CC/NUMBER 21
MAY 25, 1981

Hughes D E. A press for disrupting bacteria and other micro-organisms.
Brit. J. Exp. Pathol. **32**:97-109, 1951.
[Med. Res. Council Unit for Res. in Cell Metab., Dept. Biochemistry,
Univ. Sheffield, England]

A press is described consisting of a cylinder out of which a frozen cell paste is forced through a slit by pressure on a piston. It is used to disrupt bacteria and other microbes to obtain enzymes and other active intracellular components. [The SC[®] indicates that this paper has been cited over 290 times since 1961.]

D.E. Hughes
Department of Microbiology
University College
Cardiff CF2 1TA
Wales

April 21, 1981

"That the Hughes Press is still finding such extensive use in studies in microbial physiology after the passage of some 30 years is probably because among physical methods for disintegrating cells it is the simplest to make and easiest to use. Doubts about its mode of action were often expressed by my colleagues as brute force and bloody ignorance. However, experiments have confirmed that its efficiency, is, as I suggested, analogous to what was in 1950 known as regelation, a process by which glaciers move down a slope and entrained rock debris is fragmented. Subsequently, we have shown that both movement producing shear and pressure producing ice volume changes are necessary.

"The origin of the press arose from the frustration with the then available methods of microbial disintegration

which older colleagues will remember, and particularly the variable results of grinding cell pastes with powdered glass by hand in a pestle and mortar. Cogitations on this during cycle rides every morning steeply uphill to my laboratory connected two apparently unrelated themes. One came from Buchner's classical use of a fruit press and sand to obtain a cell free fermenting juice from yeast.¹² The other connected this to the fate of living organisms and the process by which the 'delicate cell and the ponderous bone' were fossilised and described in a poem by Raine, just then published.

"Accordingly, the first press employed powdered glass, zircon, and even diamond dust as the abrasive which, to my mind, represented mineral grains which ruptured organisms under pressure: the soluble enzymes could then be extracted. Later thoughts on glaciers and freeze thaw disruption led to the substitution of abrasives by ice crystals. The temperature chosen (-25°) later appeared to be just that at which ice crystal phase changes occurred under the pressures achieved in a 'fly press.' I still have to explain that 'fly' means quick. This had another advantage in that particulate enzymes could also be obtained by differential centrifugation.

"In this simple, perhaps crude device, a wide range of cells have been crushed and new enzymes isolated over the years. 'Crude Hughes Crush,' is now accepted in some journals. The comma is sometimes misplaced, I suspect sometimes deliberately. A review of this field was published in 1971."³

1 **Buchner E.** Alkoholische Gärung ohne Hefezellen. [Vorläufige Mittheilung.] *Ber. Deut. Chem. Ges.* **30**:117-24. 1897.

2..... Alkoholische Gärung ohne Hefezellen. [Zweite Mittheilung.]
Ber. Deut. Chem. Ges. **30**:110-13. 1897.

3. **Hughes D E, Wimpenny J W T & Lloyd D.** The disintegration of micro-organisms. (Norris J R & Ribbons D W. eds.)
Methods in microbiology. London: Academic Press. 1971. Vol. 5B. p. 1-54.