

Mapleson W W. The elimination of rebreathing in various semi-closed anaesthetic systems. *Brit. J. Anaesth.* 26:323-32, 1954.
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Five anaesthetic breathing systems (A to E), comprising various permutations of a face mask, fresh-gas flow, reservoir bag, expiratory valve, and corrugated tube, were analysed theoretically to determine the minimum fresh-gas flow required to prevent rebreathing during spontaneous ventilation. System A, the "Magill attachment," was the most efficient. [The *SC1*® indicates that this paper has been cited in over 170 publications since 1955.]

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This work was done soon after I joined the Department of Anaesthetics of the Welsh National School of Medicine (as it was then called) as a young research assistant/lecturer, fresh from my physics PhD in atmospheric electricity at the University of Durham. William W. Mushin was then head of the department, and my main initial assignment was an experimental study¹ of the muscle relaxant gallamine. The theoretical study of rebreathing was regarded as just a sideline to fill in time while waiting for volunteers for the relaxant study; yet the rebreathing paper is remembered and the relax-

ant paper is forgotten, even though it was probably the first pharmacokinetic study of a relaxant from an anaesthetics department.

There had been one or two previous theoretical studies of rebreathing with the Magill attachment (System A), but there had not been studies of any of the others, and Mushin thought that a comparison would be illuminating. One practical outcome was that most of the anaesthetic machines in the Cardiff Royal Infirmary were immediately modified from the inefficient System B to the efficient (for spontaneous ventilation) System A.

I think the paper is often quoted not so much for its findings, although those still seem to be valid, but because it happened to provide a convenient classification of breathing systems. This is reinforced by the fact that, given the components of the different systems (one each of reservoir bag, corrugated tube, face mask, fresh-gas supply, and overflow valve), the five I described (A to E) are essentially the only systems that it is possible to construct—apart from a couple of absurdities with enormous dead space. (This realisation emerged when the late Denys J. Waters and I were working out the behaviour of the systems during controlled ventilation.²)

In this respect I now regret naming³ the Jackson Rees modification of Ayre's T-piece as an additional separate system—System F—because it is simply a modification of System D: the expiratory valve is replaced by a leak.

An excellent review of the subject was published by the late Cyril M. Conway⁴ not long before his untimely death.

1. Mapleson W W & Mushin W W. Relaxant action in man. *Anaesthesia* 10:265-78; 379-90, 1955.
2. Waters D J & Mapleson W W. Rebreathing during controlled respiration with various semiclosed anaesthetic systems. *Brit. J. Anaesth.* 33:374-81, 1961.
3. Willis B A, Pender J W & Mapleson W W. Rebreathing in a T-piece: volunteer and theoretical studies of the Jackson-Rees modification of Ayre's T-piece during spontaneous respiration. *Brit. J. Anaesth.* 47:1239-46, 1975.
4. Conway C M. Anaesthetic breathing systems. *Brit. J. Anaesth.* 57:649-57, 1985.