NOTATION

R = pipe radius
T = local time-averaged temperature
T_c = T at pipe center
y = radial distance from wall

Greek Letters

ϵ = eddy viscosity
ϵ_H = eddy diffusivity for heat
ϕ = $(T - T_c)$ calc/$(T - T_c)$ exp

Subscripts

calc = calculated
exp = experimental

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Reply to Notter and Sleicher Note

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The accuracy of the eddy diffusivity ratio for the core region of turbulent pipe flow is related to problems in obtaining both heat and momentum diffusivities. I question that these ratios are more accurate than the 20% maximum deviation shown by the prior R & D note for the core region.

Notter and Sleicher state that the contention of a unity ratio for eddy diffusivities of heat and momentum at all radial positions for fully developed pipe turbulence is unwarranted, is in conflict with theoretical analyses, and will lead to errors in calculated heat transfer rates. My note did not suggest a unity ratio for all radial positions but only for the core. Figure 1 shows data for $y/R > 0.075$. Data are not shown for the wall region because there is an indication that the wall region ratio may not be unity (Hughmark, 1973). The models that yield a diffusivity ratio less than unity for liquid metals are based upon widely differing assumptions and approximations as stated by Notter and Sleicher, thus these do not appear to represent a theoretical analysis of greater accuracy than the broad range of assumptions and approximations. Table 1 shows Nusselt numbers calculated in accordance with Equations (19), (20), and (21) of my paper (1971) and Equation (1) of the note (1972) in comparison to the experimental values reported by Sleicher, Awad, and Notter. Thus these calculated values represent the assumption of an equal diffusivity ratio for the core region.

The three high velocity runs show agreement of about 10% which is excellent for liquid metal heat transfer data. The equal diffusivity ratio assumption does not lead to gross error as is implied by Notter and Sleicher.

TABLE 1. NUSSELT NUMBERS

Re	Notter et al. experimental Nu	Calculated Nu
26,000	6.8	7.9
52,000	9.1	10.4
79,000	10.5	12.8
106,000	13.5	14.8
203,000	20	20.7
302,000	29	31

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