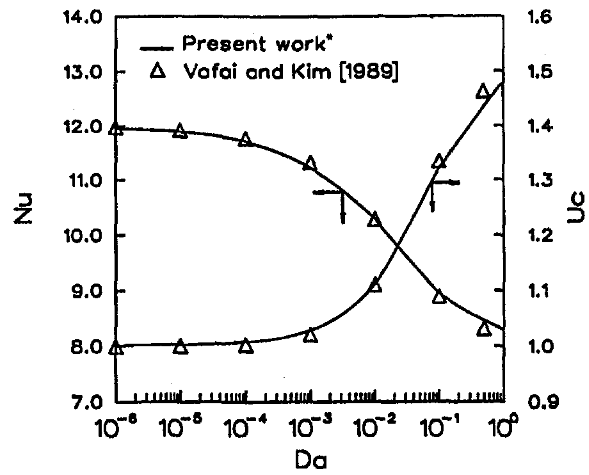

Fig. 2 Comparison of results with Vafai and Kim (1989) *Hadim, A, 1995, "Closure of 'Forced Convection in a Porous Channel with Localized Sources'," ASME Journal of Heat Transfer, Vol. 117, p. 1098.

be easily used for benchmarking the numerical solutions. However, as always, a full numerical solution can be compared with the numerical solution obtained by their Romberg's integration method and this can be a useful addition.

Vafai and Kim (1989) use $du/dy = 0$ when $u = 1$ (instead of $y = 0$) to satisfy $du/dy = 0$ as well as $d^2u/dy^2 = 0$ at $y = 0$. This strategy, which is based on the physics of the problem, as explained in Vafai and Kim (1989), is exact for known porous media. Essentially, this is exact for all practical porous media that we know of other than the interesting and unique set residing in Professor Lage's laboratory. It is important to note that Nield et al. (1996) satisfy the boundary condition $du/dy = 0$, when $y = 0$, implicitly, as was done (i.e., implicitly) in Vafai and Kim (1989). It should also be noted that the left hand side of their Eq. (8) is zero when $u = b_2$. It can then be seen that their numerical solution does not explicitly satisfy the boundary condition $du/dy = 0$ when $y = 0$, either. Their solution satisfies the boundary condition $du/dy = 0$ when $y = 0$, implicitly, which is the same way (i.e., implicitly) that Vafai and Kim (1989) arrived at their solution.

Another point that needs to be noted in Nield et al.'s (1996) work is with respect to recovering a previously obtained analytical solution from their numerical approach for the case $F = 0$. This recovery does not occur as their solution does not approach the known analytical solution as $F = 0$. They had solved the equation analytically for this new case. They did not use Eq. (11) to asymptotically get Eq. (21). When $F = 0$ their Eq. (11) takes the following form:

$$\frac{1}{\sqrt{MDa}}\, y = \int_u^{b_2} \frac{dt}{\sqrt{[t - (2\mathrm{Da} - b_2)](t - b_2)}},$$

which can be integrated to give

$$u = \mathrm{Da} - \Delta \cosh(\lambda y).$$

In our opinion, their Eq. (11) is not the final closed form solution but a mathematical representation of a numerical integration to solve an ordinary differential equation. In essence, this is equivalent to presenting

$$\int \frac{dt}{f(t)} = \int dy$$

as a solution to

$$\frac{du}{dy} = f(u)$$

which is a good representation for a numerical solution of the problem but in our opinion does not constitute an analytical solution.

Comparisons between the full numerical solution based on the momentum equation given by Eq. (4) and boundary conditions (5a) and (5b) of Vafai and Kim (1989) and the exact solution given in the same paper were shown in Figs. 1 and 2 of Vafai and Kim (1995). The exact solution starts deviating from the numerical solution for Da $\sim$ 1. For a reasonably sized porous medium this translates to a permeability, K, of about 10^{-4} or 10^{-3} m^2 at most, and probably smaller. It should be noted that real porous media have permeabilities of at least 10^{-5} m^2 and smaller. Even for the extreme nonrealistic case of K $\sim$ 10^{-2} m^2 and $\Lambda_I = 30$, the agreement is still within 0.7 percent. It should also be noted that Fig. 2 of the discussion given in Vafai and Kim (1995) was not presented by us (as Nield and Lage have incorrectly attributed to us) but rather it was produced independently using a full numerical solution by Professor Hadim. That figure, indeed, does show an excellent agreement up to Da = 1. For the benefit of the readers, Fig. 2 of that discussion, which was obtained by Professor Hadim, is reproduced here. We believe that the readers can easily see the differences between the numerical results of Hadim and the exact solution of Vafai and Kim (1989) in that uncomplicated figure and that there is no need for a guided tour. Furthermore, the cited numbers by Nield and Lage do not correspond to a real porous medium and as such do not relate to our exact solution which was for real porous media. However, we agree that the novel and interesting porous medium (a thin screen which is one mm thick) which resides in Professor Lage's laboratory falls under a different category which we refer to as a pseudo porous medium. Even though we appreciate the opportunity for the additional discussion on this subject with the authors, we believe any further discussion on what had already been presented at length would not serve any technical need.

Reference

Nield, D. A., and Bejan, A., 1992, *Convection in Porous Media*, Springer-Verlag.

Editorial Correction. The authors of the closure that appeared in the ASME Journal of Heat Transfer, Vol. 118, pp. 267–268 were K. Vafai and S. J. Kim. Our apologies for this inadvertent omission.