Even if your letter-writers were familiar with the program several years ago, don't assume the criteria are the same today and that your references are up to date on them. You need to be sure they understand the criteria upon which you will be evaluated. Feel free to communicate which criteria you believe best match your skills and which you think need the most support.

► Tell your reviewers something about yourself. Tell them why this award or position is the perfect match for you. Allow them to make the letter as personal as possible. They won't have the perspective you have; you have more knowledge about yourself and why you should be the recipient than they do. If you can sell them on your dreams, they will be able to focus that energy into a letter that can truly support you.

► Meet their timetable! Don't ask for a letter that's due tomorrow. To ensure all deadlines can be met, I suggest planning ahead by at least two weeks. A rushed letter will most likely have omissions that could hurt your application.

► Consider having an extra letter sent. One too many is better than one too few. Read the application details or call the program administrator. Usually, an extra letter just goes into the file, but the bottom line is not to be a letter short of the required number. Feel free to get confirmation that letters were sent. Some application processes have a return postcard so you can be sure.

► Try to guide the letter so it matches the narrative application and forms you have written. Don't write the letter for your reference, and if they suggest that you do so, I recommend you find someone else to do it. You want a sincere and honest opinion from a conscientious supporter. I suggest that you prepare a letter to your reference that contains the criteria and a bullet list of items you feel the letter should consider. A bullet list allows them to add their own prose as they address key points so that all letters won't sound alike. Also, just in case, if you have similar bulleted lists for different references, mix the order so they don't go down the line and hit the same points in the same sequence.

Let me add a note specifically to those of you applying for a Fulbright or other international award. For the high-demand locations such as England and Germany, you can assume that all applicants have invitation letters offering a desk and computer access. Look for *real* ties to your host institution. In today's world where it's easy to have collaborators from around the globe, you need to give the judges a reason for *physically* being there. Help your references explain why you *have* to be overseas. If possible, in addition to the host letter, have another colleague(s) within the same or a nearby country describe what your presence will mean to them.

Good luck! ❐

ChE letter to the editor

To the Editor;

Regarding the article "Making Phase Equilibrium More User-Friendly" by Michael J. Misovich,[1] we endorse some of the points made, but are also concerned by some general attitudes expressed about teaching this subject (and by extension, chemical engineering thermodynamics in general, since he makes passing reference to chemical reaction equilibrium).

On the positive side, we commend the considerable emphasis on the calculation of properties and presentation of the data graphically. We also agree with the importance of developing an intuitive understanding related to such things as order-of-magnitude values of thermodynamic quantities, and the likelihood of the occurrance of azeotropes.

On the other hnd, some statements are made that seem to place the subject matter in a very limited position relative to other courses that he mentions. For example

• *"Phase equilibrium . . . in which abstract concepts are presented to the near exclusion of practical examples."*

• *". . . most phase equilibrium courses (sic) do not connect these (calculations) to real processes or equipment."*

• *". . . this class deals with techniques for generating data . . . to the total exclusion of applications."*

It seems no wonder then that "students who perform calculations satisfactorily seem confused over the meaning of what they have learned." These statements also tend to run counter to Felder's TIP 1,[2] notwithstanding the subsequent emphasis on graphical presentation.

To the contrary, we believe that teaching this subject without overtly involving applications (processes and equipment) amounts to emasculation of it. One thing that should be emphasized is that thermodynamics (as the umbrella subject) provides limiting or boundary solutions to problems, but is silent on "efficiency," in various guises, that translates the limiting-case results into actual results. It is inevitable that

this requires, however, the introduction of actual processes (and equipment), and in this way bridges can be built to these other courses.

The author is undoubtedly aware of many such applications, as he indicates, and we mention only a few (not necessarily directly related to phase equilibrium, but to equilibrium in general):

- Separation of a condensable from a noncondensable species (cooler-condenser); also related to himidification and dehumidification

- Eutectic behavior related to the use of ethylene glycol antifreeze coolant (automobile engine) and its vapor-liquid counterpart in "steam distillation"

- Vapor-compression refrigeration (compressor)

- Energy conversion (fuel cell or electrochemical cell in general

- Equilibrium reaction yields, equilibrium species distribution in general (equilibrium-limited reactor, whether batch or flow system)

The author also expresses a strong preference for the use of computer spreadsheets, although he acknowledges the possible alternative use of metacomputing software (such as Maple[3]), which, in our opinion, is more efficient. In addition, this software does not require the trial-and-error or iteration approaches mentioned by the author for some of his assignments.

If the goal is to produce graphical visualization of behavior, then spreadsheets have the inherent limitation that the explicit generation of data must precede the generation of graphs. Spreadsheets can only easily generate such data if the equations are available in analytical form; otherwise, trial-and-error or iterative procedures must be used, as he notes. In contrast, metacomputing software provides graphing commands that do not require such explicit prior data generation.

Furthermore, any required data can be obtained separately, without trial-and-error or iterative procedures.

As an example, if plotting the graphs $P(x_1)$ and $P(y_1)$ for the ideal system in his Figure 1 is the objective of a student assignment, Maple requires only the following statements (only the first two lines are required for the plotting; the other lines relate to cosmetic aspects of the display):

```
> Psat1:=(value);Psat2:=(value);
> plot(Psat2+(Psat2-Psat1)*x,Psat1*Psat2/(Psat1+x*(Psat2-
Psat1)),x=0..1,
axes=BOXED,xtickmarks=10,labels=["x1,y1","P/mm Hg"],
labeldirections=[HORIZONTAL,VERTICAL],title=[P-x-y diagram"])
```

Using the implicitplot command, we can readily construct Txy diagrams with Maple, for both ideal and nonideal systems, without trial-and-error or iterative procedures.

As a further example of the use of metacomputing software in phase equilibria, we note that Dickson, *et al.*,[4] have demonstrated the use of Mathcad[5] to obtain 3-dimensional vapor-liquid equilibrium envelopes.

In conclusion, although we agree with much of what the author says, we believe that there is more than he allows in "making phase equilibrium more user-friendly."

R.W. Missen
University of Toronto

W.R. Smith
University of Ontario Institute of Technology

References

1. Misovich, M.J., "Making Phase Equilibrium More User-Friendly," *Chem. Eng. Ed.,* **36**(4), 284 (2002)
2. Felder, R.M., "How to Survive Engineering School," *Chem. Eng. Ed.,* **37**(1), 30 (2003)
3. MAPLE is a registered trademark of Waterloo Maple, Inc.
4. Dickson, J.., J.A. Hart, IV, and Wei-Yin Chen, "Construction and Visualization of VLE Envelopes in Mathcad," *Chem. Eng. Ed.,* **37**(1), 20 (2003)
5. MathCAD is a registered trademark of MathSoft, Inc. ❑