

## IMPOSTORS EVERYWHERE

**EDITOR'S NOTE:** This paper introduces a new column in *CEE* – an expression of opinion by a frequent contributor to *CEE*. The column will supplement our regular "Views and Opinions" department.

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HE KNOCKS ON my office door, scans the room to make sure no one else is with me, and nervously approaches my desk. I ignore the symptoms of crisis and greet him jauntily.

"Hi, Don—what's up?"

"It's the test tomorrow, Dr. Felder. Um . . . could you tell me how many problems are on it?"

"I don't see how it could help you to know, but three."

"Oh. Uh . . . will it be open book?"

"Yes—like every other test you've taken from me during the last three years."

"Oh . . . well, are we responsible for the plug flow reactor energy balance?"

"No, it happened before you were born. Look, Don, we can go on with this game later but first how about sitting down and telling me what's going on. You look petrified."

"To tell you the truth, sir, I just don't get what we've been doing since the last test and I'm afraid I'm going to fail this one."

"I see. Don, what's your GPA?"

"About 3.6, I guess, but this term will probably knock it down to . . ."

"What's your average on the first two kinetics tests?"

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"92."

"And you really believe you're going to fail the test tomorrow?"

"Uh. . . ."

Unfortunately, on some level he really does believe it. Logically he knows he is one of the top students in the department and if he gets a 60 on the test the class average will probably be in the 30's, but he is not operating on logic right now. What *is* he doing?

The pop psychology literature calls it the *impostor phenomenon* [1]. The subliminal tape that plays endlessly in Don's head goes like this:

**I don't belong here . . . I'm clever and hard-working enough to have faked them out all these years and they all think I'm great but I know better . . . and one of these days they're going to catch on . . . they'll ask the right question and find out that I really don't understand . . . and then . . . and then. . .**

The tape recycles at this point, because the consequences of *them* (teachers, classmates, friends, parents, . . .) figuring out that you are a fraud are too awful to contemplate.

I have no data on how common this phenomenon is among engineering students, but when I speak about it in classes and seminars and get to ". . . and they all think I'm great but I know better," the audience resonates like a plucked guitar string—students laugh nervously, nod their heads, turn to check out their neighbors' reactions. My guess is that most of them believe deep down that those around them may belong there but they themselves do not.

They are generally wrong. Most of them do belong—they will pass the courses and go on to become competent and sometimes outstanding engineers. But the agony they experience before tests and whenever they are publicly questioned takes a severe toll along the way. Sometimes the toll is too high: even though they have the ability and interest to succeed in engineering, they cannot stand the pressure and either change majors or drop out of school.

It seems obvious that someone who has accomplished something must have had the ability to do

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so (more concisely, you cannot do what you cannot do). If students have passed courses in chemistry, physics, calculus, and stoichiometry without cheating, they clearly had the talent to pass them. So where did they get the idea that their high achievements so far (and getting through the freshman engineering curriculum is indeed a high achievement) are somehow fraudulent? Asking this gets us into psychological waters that I have neither the space nor the credentials to navigate; suffice it to say that if you are human you are subject to self-doubts, and chemical engineering students are human.

What can we do for these self-labeled impostors?

*Mention the impostor phenomenon in classes and individual conferences and encourage the students to talk to one another about it.*

There is security in numbers: students will be relieved to learn that those around them—including that hotshot in the first row with the straight-A average—have the same self-doubts.

*Remind students that their abilities—real or otherwise—have sustained them for years and are not likely to desert them in the next twenty-four hours.*

They won't believe it just because you said so, of course—those self-doubts took years to build up and will not go away that easily. But the message may get through if it is given repeatedly. The reassurance must be gentle and positive, however; it can be helpful to remind students that they have gone through the same ritual of fear before and will probably do as well now as they did then, but suggesting that it is idiotic for a straight-A student to worry about a test will probably do more harm than good.

*Point out to students that while grades may be important, the grade they get on a particular test or even in a particular course is not that crucial to their future welfare and happiness.*

They will be even less inclined to believe this one but you can make a case for it. One bad quiz grade rarely changes the course grade, and even if the worst happens, a shift of one letter grade changes the final overall GPA by about 0.02. No doors are closed to a student with a 2.84 GPA that would be open if the GPA were 2.86. (You may not think too much of this argument but I have seen it carry weight with a number of panicky students.)

*Make students aware that they can switch majors without losing face.*

It is no secret that many students enter our field for questionable reasons—high starting salaries, their fathers wanted them to be engineers, their friends all went into engineering, and so on. If they can be persuaded that they do not *have* to be chemical engineers (again, periodic repetition of the message is usually necessary), the consequent lowering of pressure can go a long way toward raising their internal comfort level, whether they stay in chemical engineering or go somewhere else.

*Caution*, however. Students in the grip of panic about their own competence or self-worth should be deterred from making serious decisions (whether about switching curricula or anything else) until they have had a chance to collect themselves with the assistance of a trained counselor.

One final word. When I refer at seminars to feeling like an impostor among one's peers, besides the resonant responses I get from students I usually pick up some pretty strong vibrations from the row where the faculty is sitting. That's another column.

## REFERENCE

1. Pauline R. Clance, *Impostor Phenomenon: Overcoming the Fear that Haunts Your Success*, Peachtree Pubs., 1985. □

## LETTER TO THE EDITOR

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The differential of this quantity is

$$dA^0 = -S^0 dT - PdV^0 + \sum_{k=1}^n \mu_k^0 dN_k$$

and the variation in question is

$$\left( \frac{\partial A^0}{\partial N_1} \right)_{T, V, N_j [1]} = \mu_1^0 - P \left( \frac{\partial V^0}{\partial N_1} \right)_{T, V, N_j [1]}$$

By analogy with the previous case, the second term on the right is canceled by differentiation of the NRT  $\ln V^0$  term in Eq. 3 and is accordingly absent from Eq. 4. The fact that this cancellation has taken place is not apparent from the expression appearing at the top of page 204, and a note to this effect may help students follow the development.

*Literature Cited:* Modell, M., and R. C. Reid, *Thermodynamics and Its Applications* (2nd ed.), Prentice-Hall, Englewood Cliffs, NJ (1983).

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