My journey through chemical engineering at the University of Delaware (1975-1979)

8/14/14

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On this 100th anniversary of the University of Delaware Chemical Engineering Department, I thought that I could provide some personal memories for the class of 1979 and also some perspective on the curriculum of that era. In the years since 1979, I have taught most of the courses, have endured "4" ABET reviews as the point person for our department and I have had the good fortune of regularly interacting many current and former Delaware faculty in the larger community of academic chemical engineers.

Perhaps others of my class and era will find interest in my thoughts about: "the greatest of all undergraduate majors", "the ultimate liberal science degree" or just "The hardest major on campus!"

Newark Delaware before matriculation at UD.

While I had lived in Pittsburgh and Boca Raton earlier in my life, I spent the 6 years before college in Newark attending Shue Middle School and Newark High School. Although I did not know it, my first associations with people of the University of Delaware occurred during these times. I was in the band with Katie Gerster and recall the unfortunate passing of her father (Jack Gerster). I knew Bruce Russell, also from band, and have been extremely fortunate to have a lifetime relationship with his father, Fraser (who I don't think I met until the first class at Delaware), including many spirited debates about multiphase flows and teaching transport phenomena! Other "names" I encountered were Kwart, McCurdy, Baxter, Goodwin, and Seidel.

UD Fall 1975

My choice of major was fortuitous and haphazard but I was in the right major in what I will the claim, the best possible program (at least for me) at that moment in time. During the fall semester, I met Professor Harvey Blanch[1] in "EG 125". We made jokes about Harvey being "just off of the boat" from Australia, but I recall every minute of his class as being enjoyable. We did *Basic* programming and some elementary chemical engineering analysis. I recall, which would be consistent with Harvey's research interests, that he talked about penicillin production. The class met 2 times a week, but it was remarkable because each of the small sections (say 30

[1] Harvey moved to Berkeley soon after and has had a very distinguished career!

students), had a different faculty member[2]. I know that one of the other sections was taught by Professor James Wei (who later went to MIT and completely transformed chemical engineering there before becoming Dean of Engineering at Princeton.) There was at least one more section and another faculty member whose identity I don't know.

All of us were taking C 111 *General Chemistry* from Professor John Burmeister and at times Professor Burnaby Munson. The universal opinion was that this class quite enjoyable to attend and excellent in all ways! While there was no way for this to be apparent to me at the time (but will be mentioned repeatedly below), this course was indicative of the careful thought that went in the content of all of the courses and the curriculum in general. For example I recall Professor Burmeister telling us that he was including a module on "predicting products of chemical reactions", not a point any significant emphasis in the textbook[3], because he saw a weakness in this important concept in incoming *graduate* students[4].

Fall 1976

The next chemical engineering course, CHE 230 *Introduction to Chemical Engineering Analysis* which is where I met Professor Fraser Russell. Another section was taught by Professor David Boger[5], who was visiting from Monash, (there was a third section again taught by a still nameless faculty member). Fraser Russell defines "take charge of the room" and is in all ways an absolutely excellent classroom lecturer. More importantly, in my big picture view of the curriculum, what he taught and how it was structured was the best way to start teaching "chemical engineering analysis", (i.e., problem definition, use of fundamental principles and constitutive equations to develop a "model", solve and compare with physical fact — a big point of emphasis by Russell). The straightforward control volume approach with clear conservation principles (overall or component mass balance) and then the use of consistent, generalized notation to create the mathematical representation was certainly the best way for me to learn this subject.[6] (The market leader textbook doesn't do either of these nearly as well!) This was the only chemical engineering class of fall sophomore year but all of us were taking physical chemistry from Professor Robert Wood[7]. That this course was in this curriculum slot, (as

[2] My meaning is that all of the faculty were faculty members who were tenured or on the track to tenure and who thus had both teaching and research responsibilities.

[3] R. E. Dickerson, H. B. Gray, G. P. Haight, *Chemical Principles*, 2nd ed. 1974.

[4] Nowadays in many academic circles, "how" something is taught and "proof" that some particular snippets of learning allegedly occurred is considered more important than "what" is being taught. This example is from the beginning of C112 was motivated by an opinion piece by D. Davenport, *J. Chem. Ed.*, **47**, p271, 1970.

[5] David Boger earned a PhD from the University of Illinois under the direction of James W. Westwater. Westwater earned the first PhD from the University of Delaware under the direction of Bob Pigford. (Allan Colburn probably was also involved as Dr. Westwater acknowledges both Pigford and Colburn in the publication on the work of his Thesis.)

[6] and (I hope) as well for some hundreds of students at Notre Dame to whom I pitched in exactly the same way in the 1990's using a "1.5 edition" of Russell and Denn. The original is: T. W. F. Russell and M. M. Denn, *Introduction to Chemical Engineering Analysis*, Wiley, 1972.

[7] Several of us also played squash with Prof. Wood and his graduate students

opposed to a year later) was testament to the thoughtfulness of the chemical engineering faculty who wanted us to see the basic elements of thermodynamics, in the way that physical chemists think about them, before we heard these in the chemical engineering thermodynamics class[8].

At least for me, the next semester, when we started thermodynamics (at the time still called CHE 231, *Introduction to Chemical Engineering Analysis*), was a big step up in intensity and workload. I think it was either the first or second year of a curricular change that had shrunk the Russell-Denn course to just one semester and thus only mass balances with "energy balances" just being the start of thermodynamics. We had the notes that predated Professor Sandler's book[9], which has become (IMHO), the best overall chemical engineering textbook ever published. I was in the section that Stan taught. Professor Michael Paulaitis[10] taught a section and perhaps David Boger(?) did a third section. Suddenly the complete intuitiveness of mass conservation was gone (for me), but I can say having taught thermodynamics (from other books as well as *Chemical and Engineering Thermodynamics*) that Stan's approach is logical and very clear. His innovation, basing examination of energy conservation and study of "entropy" on generalized balance equations that were valid for steady state or transient situations, open or closed flows, changed how thermodynamics is taught[11]. Further, you have to look pretty hard to find a statement that is not exactly correct… which is not true in general of undergraduate thermodynamics textbooks. I, and I think my classmates, marveled at the focus and clarity of Stan's lectures. We were also impressed how he always got the "carets" the overbars and the subscripts correct in the derivation. In addition to presenting the initial part of the subject with the new balance equation format, Professor Sandler derived the criteria for phase equilibria, from the first and second laws of thermodynamics[12] much more rigorously than the other texts of this era.

After sophomore year, it was the summer of 1977 and as I lived in Newark and by this time very much knew I wanted to be a chemical engineering professor "when I grew up", was fortunate to get a job working in the laboratory of Professor Glenn Schrader[13]. Glenn had come to Delaware a year or so earlier and his research interests were in catalysis. My desire to get a faculty job came out of doing some experiment work on aging of polyethylene with Professor Jerold Schultz. I had sought this opportunity after I had found out that in the previous summer, when I

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[8] A general thought nowadays by chemical engineering faculty is that once the students get thermo from them, there is no point to hearing it from a physical chemist!

[9] S. I. Sandler, *Chemical and Engineering Thermodynamics*, Wiley, 1977.

[10] Mike later moved to Johns Hopkins and is now at Ohio State

[11] Thermodynamics books of this time defined the first law of thermodynamics in terms of internal energy and heat and work for a closed system and inferred a property that was called entropy based on the "desired" result for efficiency of an ideal heat/work cycle.

[12] Perhaps this could be "fact-checked" but I don't think that the text refers to energy and entropy relations as "laws" although this terminology was used in the PChem class.

[13] Glenn moved to Iowa State a few years later, spent some time at the National Science Foundation and now is faculty member of the University of Arizona

was playing trumpet in the *New Castle County Bicenntenial Band*, Mike Mackay was already working for Professor Schultz gathering data for his first publication. To be more graphic, I was playing outdoor band concerts in knickers while Mike[14] was cracking samples of poly (methyl methacrylate) with an Instron® Machine! The benefit to me of Professor Schultz[15] providing an opportunity to do research during the winter and spring of this year is incalculable as it set up my entire professional career!

Fall 1977

The next Fall brought C 331 *Organic Chemistry*, in the newly opened *Kirkbride* Hall. Professor Richard Heck came to class the first day and drew something or the other on the blackboard but, we could not read or see what he had written! The lighting for the room had a flawed design with no lights directly shining on the chalk board. "Can" lights were spaced randomly over the audience so that our notebooks either glowed brightly or were completely in the dark. Professor Heck was a quiet but determined person and so the next day came to class with a box with multiple colors of chalk. After trying several colors, it was decided that pink was tolerably visible. So he proceeded to teach organic chemistry using pink chalk. It is interesting that his Nobel prize in 2010 originates with work that he did while a chemist at *Hercules Chemical* company that was published as 7 successive papers in JACS (*Journal of the American Chemical Society*)[16].

Of course if you are still reading it is not because of organic chemistry it is because you are waiting to hear about the chemical engineering courses. For the correctly titled CHE 325 *Chemical Engineering Thermodynamics*, we now had Stan's book in print. I was in a section taught by Stan and he continued his excellent teaching. I must have figured out something over the summer as I found the fall course much easier than the first semester[17]. During this semester the progression of analysis used the Gibbs-Duhem equation quite a bit so that Stan had designated one of my classmates as the "Gibbs-Duhem siren", Stan would just call him by name and "Rick[18]?" would say "this is true because of the Gibbs-Duhem equation"! We also heard Stan talking about grading our tests after dinner with a glass of sherry and having to take a big gulp when he saw a particularly egregious mistake… which made all of us wonder how he walked upstairs to bed that night! Perhaps Mike Paulaitis taught a section and I think this was the semester of some "enrollment controversy" so that a third section was taught in the evening

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[14] Mike and I were again together at Illinois before he went to Australia to start his career and then to Michigan State before coming home to UD. Chuck Jergensen was also at Illinois at this time getting a PhD with Harry Drickamer.

[15] I found out soon after that Professor Schultz had been sitting a few rows in front of me playing flute in the Newark Symphony Orchestra.

[16] There is no way for me to atone for sins as a student in Prof Richard Heck's class, but I was awake at 5:45AM in 2010 watching the Nobel Prize announcement when Richard Heck's picture came on the screen, with the narration at first in Swedish. This was really cool!

[17] Since I have also taught the same students "back to back" (and I am sure that they got tired of my same old lame jokes), I want to emphasize my complements about Professor Sandler's teaching

[18] This can't be the right name. I have a couple of guesses, but someone will have to fess up!

by (maybe) Bill Manogue from DuPont. As a student I did not know exactly what was happening but that the department apparently always had accommodated 90 sophomores but only 60 juniors. At the beginning of the semester there were more than 60 juniors and so the first try was to use a GPA cutoff and not let the "extra" students, maybe more than a dozen, enroll in the junior classes. One could speculate about irate parents, state politicians, University Presidents and Engineering Deans, but at the end of the day, there was a third section for thermodynamics and fluid mechanics (and potentially a hastened change in the department chair…)

While Stan, his approach, and his book, had been inculcated into the fabric of our lives, fluid mechanics was all new and "exciting". This class, CHE 341, was taught by Gianni Astarita who was fully and completely Italian with an faculty appointment at Naples but who spent a semester at Delaware each year[19]. Gianni was very animated and possessed the very definition of a perfect Italian accent when speaking English. Although Denn had already moved to Berkeley (or perhaps he was just "visiting" before he moved), we were using Mort Denn's notes for this forthcoming textbook[20]. Gianni was a fine teacher and the accent was in no way a barrier to communication. However, while this subject eventually became central to my thesis topic, a great deal of my research and 30+ semester courses that I have taught, at the time I found the subject quite confusing. Still was fun and Gianni's animation greatly added to this enjoyment. When I say we were using Denn's notes, we were getting them piecemeal. One week (it must have been on Thursday) we got to the end of class (and the end of the notes… something that never would happen with a full text) and Gianni said that we would have class the next Tuesday but he had "no idea" what the lecture would be on as he had not received the notes (and apparently we didn't have a syllabus.. nor learning objectives or assessment procedures…!!##). Well the notes came and we started boundary-layer theory or maybe it was a derivation of the Navier-Stokes equations. I didn't know it at the time, but Mort's book was likewise a departure from the competing texts in that it contained a lot more intuitive arguments and "engineering" than *Transport Phenomena* by Bird Stewart and Lightfoot), but was much more exactly correct and had a more complete treatment of the differential equations of fluid mechanics than the "Unit Operations" books that might have been used for this subject at the time. Again, while it is just a personal opinion, none of the subsequent books, all the way until today, that could be used by undergraduate chemical engineers, do as well with this subject as Mort did[21]. In particular starting this very complex subject with a dimensional-analysis based approach to pipe flow and then a chapter on particulates and packed beds is a very good way to give students a level of physical understanding for what is a very intricate and complicated subject. Another highlight of the text is that he derives the "Engineering Bernoulli Equation" from the first and second laws of thermodynamics and shows how a "loss term" arises naturally from the conversion of

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[19] Actually the joke still heard about Gianni is that he had "full-time" appointments at both Delaware and The University of Naples.

[20] M. M. Denn, Process Fluid Mechanics, Prentice-Hall, 1980.

[21] I have not been able to use Denn's text for a class since I last taught this course in the mid 1990s but Wes Burghardt from Northwestern tells me that he still uses it.

mechanical energy to heat and that this term is necessarily (thanks to entropy) irreversible with a "+" sign. No other undergraduate fluid mechanics book is quite so careful and clear about this.

You may know that fluid mechanics in chemical engineering is often taught as "momentum transfer" within the combined subject of *Transport Phenomena* whether this is from the Bird-Stewart and Lightfoot (BSL) book or the book by Welty, Wicks and Wilson or something else. By the 1970's this approach had spread far and wide within chemical engineering departments, but Delaware continued to teach this material with the fall fluid mechanics being pedagogically separate from the spring course, CHE 342 entitled *Heat and Mass Transfer*. The subtle difference is that while in the fall we spent plenty of time on differential fluid mechanics, the heat and mass transfer class did not start by trying to "convince" us that for heat transfer, the heat flux vector was essentially the same as "tau" a momentum "flux" (tensor) that we had called a shear stress. I am not sure if the faculty at the time were being cavalier in the sense of not wanting to be "on the band wagon" with the people from Wisconsin — surely a peer, competitor department — or if they had a particular dislike of the analogy (a camp that I fall into for students just learning the subject) or that they had always taught the courses as not being linked and did not want to change. In any case we started *Heat and Mass Transfer* in chapter 8 of BSL (which then cost $24.50, no tax, at the UD bookstore) with Lloyd Spielman teaching us. Professor Spielman, who had a joint appointment in Civil engineering was not particularly animated and "stuck to the script of BSL". While this was a bit of a grind, it was pedagogically a good idea for all chemical engineering undergraduates to spend at least a little time using the BSL textbook[22]. It was during this time, that even more dimensionless groups were introduced as correlations for heat transfer coefficients. Patricia Mackenzie and I decided to get in the spirit and invent one of our own, *the ratio of how smart you are divided by how smart you think you are*! I (at least) have always called this the "Carter Number" after the president of the time[23]. The second half of this class, taught by Professor James Katzer (or soon after moved to Mobil Oil Co.), was completely different. The detailed analysis of differential equations was largely missing, replaced by a much more conceptual engineering approach that yielded such abbreviations as LHSV[24] that I am sure I did not appreciate at the time. Jim did one simple demonstration that was particularly informative and effective. He always came to class with some soft drink or the other. I presume it was in an aluminum can (but probably not *Tab*®… that he surely would not put it on his morning cereal like one of the aforementioned people in this essay!). He asked the question if you have liquid in a tank sparged with gas, how much of it is gas? Well, if you take glass and dump the soda in quickly for a few seconds you have a mixture of CO2 and liquid that sure looks like you would envision a tank sparged with gas to be. When the bubbles rise to the top you find out that the answer to the question is about 1/3! From first hand experience, I can say that such demonstrations with soda, including the question of why shaking the bottle causes the violent emptying upon opening, are less messy if they are done with

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[22] I was amazed that in certain situations, adding insulation to a heated wire will increase the heat loss rate!

[23] It was not until a couple of decades later that I realized that a Proverb supposedly from Confucius could be made dimensionless in terms of the Carter number, http://www3.nd.edu/~mjm/confucius.pdf

[24] *Liquid Hourly Space Velocity*

a <u>diet</u> flavor. Of course the bubbles are better if there is sugar in the water! I don't recall that Katzer referred to any book all that often when he lectured and most of the homework problems were ones that he made up, but we all purchased the Unit Operations book by the people at Lehigh[25], Foust et al. Until just recently when *Engineering Toolbox* became available on the web, there were a certain set of physical properties that I always looked up in the Foust book. Perhaps my memory is not completely clear, but I think we had tests for this class at night. You could bring any books that you wanted and you could stay as long as you wished. For one of the tests, which, no kidding, was "design a shell and tube heat exchanger", "design a packed gas absorber", "design a CSRT with a particulate catalyst", I was walking in with "Peters and Timmerhaus"[26] as one of the books and the ever so clever Kathy Koch saw this and said, "so, are you going to cost the equipment too!"

In this semester we were also taking CHE332, *Chemical Engineering Kinetics*, taught by Glenn Schrader from the newly published book by Charles Hill of Wisconsin[27]. I remember Glenn saying that he liked the mix of classic reaction engineering (a la Levenspiel's book[28]) with kinetics and catalysis. In retrospect this is another example of a Delaware course taught with the best possible content. At the time I thought that this class was great at unifying much of the coursework from previous semesters. Interestingly, given the title of the course, we already had seen a nice (i.e., mathematics and data) introduction to chemical reaction kinetics in the intro course — which is another nice feature of the Russell-Denn book.

But, really, all my classmates and I did during this semester was write reports for junior lab (CHE 345 *Chemical Engineering Lab* I)! This was another highlight of Delaware undergraduate program as each of the experiments was directed by one of the regular faculty who graded all of our reports. Perhaps my classmates will recall "the rotameter", salt tablets dissolving, a pipe flow experiment, a heat transfer experiment with condensing steam and the elusive question from Stan Sandler ("… you know, if you don't let some steam leak out, even though it is otherwise condensing, eventually the device will stop working! How come?…"), a VLE experiment and a couple of others that I don't recall. It is no less than admirable that the faculty took this task so seriously[29]. I learned an immense amount and my writing improved markedly. (… too bad that I have regressed.) Every undergraduate chemical engineering program that I know of has a pretty serious chemical engineering lab course that requires a significant amount of technical writing.

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25 A. S. Foust, L. A. Wenzel, C. W. Clump, L. Maus and L. B. Anderson, Principles of Unit Operations, Wiley 1960.

[26] M. S. Peters, K. D. Timmerhaus, *Plant Design and Economics for Chemical Engineers*, McGraw-Hill 1968, 2nd Ed.

[27] C. G. Hill, *An Introduction to Chemical Engineering Kinetics and Reactor Design*, Wiley, 1977

[28] O. Levenspiel, *Chemical Reaction Engineering*, Wiley 1972, 2nd Ed.

[29] At about this time, academic chemical engineering was changing pretty rapidly with the quantitative aspects of research increasing greatly. It appears that the teaching load at the time was ~3 courses per year for each faculty (and potentially repeating lectures) and they directed 2-4 graduate students. Within a decade the teaching load was less than 2 courses per year and many faculty had a dozen or more graduate students (and had increased their grants accordingly). Nowadays, it would be very difficult for a modern chemical engineering department to work out a teaching schedule with many different faculty directing and grading the reports.

However, in the days of erasable typewriter paper, "log-log" paper that we purchased and second generation calculators, we each wrote 7 reports! You had a partner to do the experiment and calculations, but the reports were expected to be your own. I recall Liz Murphy lamenting that Professor Metzner[30] had written a comment in her report along the lines of "this point is stated much more clearly by Mr. (Dennis) Newell" who was her lab partner. Fortunately the electrical engineers had been busy with useful technology innovations to help make our lives better as this was this semester that my lab partner, Rich Coe and I both got TI58 programmable calculators. When we were going through the calculations for, say, pipe flow, (that nowadays would be easily handled with a spreadsheet), we would each try to program the formula for the next "column" and who ever got it first, would do the calculations on his calculator. Then, we went on to, say the friction factor column and repeated the exercise! During this semester we met Professors Costel Denson and (I think) Jon Olson and Roy McCullogh in the lab course.

When I teach our juniors in the fall, I ask them "who" they are, a popular answer is "a chemical engineering major". I say OK, when I ask you in May who you are, you will say "a chemical engineer!". This was surely true for me and my classmates during the 1977-78 school year!

Fall 1978

In some ways, senior year was much less intense and eventful. We showed up in the fall facing only 4 experiments in the undergraduate lab that we wrote as groups. I recall doing gas absorption[31] directed by Professor Robert Pigford who I was also lucky enough to later take a class from. Another experiment was yeast fermentation which was directed by Professor Bruce Gates (who later moved to UC Davis). One of us (no, I am sure it was Mackay!), in a bit of clumsiness, broke the glass frit sparger off of the end of the air supply line to the reactor. When Patricia wrote the report, (or at least her part of the report), she mentioned this broken sparger several times… perhaps as an excuse for the data not fitting the standard growth/death model for yeast. At the defense, Bruce in a bit of wry humor, wanted to know if the sparger was intended to be a "Christ symbol"!

The core class for all of us was CHE 443, *Stagewise Mass Transfer Operations* taught by Stan Sandler again. (He had to be getting tired of us!) He did his usual excellent job using Treybal's class text *Mass Transfer Operations*. It was listed as, and had previously been a 2 credit class, but I am pretty sure we met 3 times a week and I know that we did plenty of continuous contacting operations, in addition to the venerable *Ponchon-Savarit* method for stage-wise distillation. Of all of the curricular content of chemical engineering of 1975-1979, this may be the only topic that is no longer taught anywhere in the US!

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[30] Professor Arthur Metzner (until just then, the department Chairman…) mentioned one time, when we asked about getting reports back from other faculty, that he had "less influence with his colleagues than before"!

[31] I just saw this report last weekend while doing some house cleaning and recalled that George Becky was one of my lab partners. (Along with the above-mentioned Mackay and Mackenzie.) I talked to George, briefly in the parking lot of a motel in Cranberry PA a few days before Christmas in perhaps ~1996. I had a Delaware sweatshirt on and even though it was dark, he determined that he knew me. Wow! It was good to talk with him.

The final semester was a relief as we all knew that the end was coming — although apparently not completely without stress as sometime near the end of the semester Fraser Russell "ordered" Patti Mackenzie and I do go down to Library Circle and look at the Magnolia trees! The job market was OK and those of us going to grad school had multiple choices. There was one more core class that was a particularly special and important component of the undergraduate curriculum. This was CHE 432, *Chemical Process Analysis*, which was always jointly taught by an engineer from DuPont and one of the chemical engineering faculty. The UD faculty member was Mike Paulaitis, a familiar face, and the DuPont engineer was Dr. Hans Haug. Dr. Haug was a chemical reaction/reactor specialist… a useful skill for the premier chemical company of this era. The course mixed textbook design (actually I don't really remember much of this) that Mike lectured about and a design project that Hans described and then consulted with us through the semester. It seemed like everything that Dr. Haug said was interesting and one day he uttered one of the most profound things I have ever heard. He said "the more you know, the better engineer you will be." He meant this not just more about engineering, but more about <u>everything</u> because engineering is practiced in society at large. I hope that the quote and attribution are correct as I use this quote with every new class of students I meet. Thanks to Jim Tilton of DuPont, I now have a photo of Hans to show when I talk about him. In this pre-process simulator era, we were able to flowsheet, size and cost a simple separation process that had some complicated equilibrium behavior. In total this was an excellent course and the culmination of was, and still stands up as, one of the best chemical engineering programs in the world!

Postscript:

I did not know until recently that *Colburn Laboratory* was the <u>second</u> building on campus named after Allan Colburn. The first is the dorm now called *Lane Hall*. (Sorry to anyone who had to live there!)

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Who got Mike Klein's chair?

You may have heard about a short book with a provocative title: *Who got Einstein's office*. By some known or unknown process, before heading off to graduate school at MIT, Mike Klein had managed to get a real office desk chair that swiveled and rolled. Obviously, he could not take it with him (or maybe not so obviously), but in any case, the answer is Mike Mackay!

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One of my classmates who has not yet appeared in this this short story is Tom Gray. While he could be included in this document for many reasons, the best would be because in the days

before “sticky-notes” and highlighters, Tom would make his own index “tabs”, of the major topics contained in a course and meticulously attach these. This certainly made taking a test go more efficiently if he needed to scan through the book hoping for some insight on a problem. (I never heard if Stan bought the thermo book back from Tom to see if his book index needed some additions!) In any case I had told part of this story to my students one day and later in the week at a Notre Dame event for admitted high school students, someone called my name and I turned around, (really, the same week) and Tom Gray was standing there!
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One course that I did not mention above was Chemical Process Control which was a well-liked elective taught by Professor Jon Olson[32] who many of us have had the pleasure to interact with in our role as alums! I have never taught Control and actually have been careful to avoid ever having to try since I did not take the course as an undergraduate. As with many things (e.g., post moves in basketball[33]), if you don’t learn them by a certain age, it is really hard to learn them at all!

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Just this last May I was at a *Council for Chemical Research* meeting with Bramie (Lenhoff) in Alexandria, Virginia. He mentioned that he had just returned from a quick trip back to Newark to attend the Senior/Faculty Banquet. I am very glad that this continues as I remember it as a very nice event with most of the seniors and most of the faculty in attendance. A highlight was the faculty giving out awards to students that were “named”, in a clever fashion, after various members of the faculty. I was really pleased to such an award (which I won’t specify), which I hope was not meant in jest. I recall that George Becky got another (which I again won’t specify) which was in jest. Of course there were many more that I don’t recall.
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One last vivid memory that I will include is a meeting that I had with Professor Schultz as my academic advisor when he went through the list of courses for the entire curriculum and checked them all off! I really was going to graduate!

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[32] I am pretty sure that JHO cleaned up a racquetball court with me a time or two. Maybe Mike Mackay had better luck!

[33] Jerry Schultz and Bruce Gates were avid lunchtime basketball players.