Interview with Jessica Utts

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Interview with Jessica Utts

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Beginnings

AR: Thanks very much, Jessica, for agreeing to chat with me for the Journal of Statistics Education. *Let me start when you were eighteen years old. Where were you then, and what were your career plans at that point?*

JU: I turned 18 during my first semester in college, at the State University of New York at Binghamton. I was extremely naïve about lots of things, including career options, so I don't think I had any career plans. I knew I wanted to major in math, but other than being a high school teacher, I had no idea what one could do with a math major. I didn't even know what graduate school was (wasn't the whole purpose of going to any school to graduate??), and didn't know the difference between a master's degree and a Ph.D. degree.

Many of my friends were psychology majors and their classes sounded more interesting than mine, so during my sophomore year I decided to double major in math and psychology. During my junior year I took the statistics course offered by the psychology department and also took a

course called something like "mathematical models in psychology." From those two courses I realized that there was a way to combine my two majors. Around the same time one of my math professors, whose father was a statistician, told me that there was a career choice called statistics and suggested that I write to ASA for more information. That's how I learned about graduate schools in statistics.

AR: And then you applied to, attended, and even graduated from a graduate school! How did you choose Penn State, and what did your studies focus on there?

JU: It's amazing how one phone call can change your life. I applied to four statistics graduate programs and was accepted with financial support as a teaching assistant by three of them. (I applied to Penn State mostly because my mother had graduated from there, but I can't tell you why I applied to the other three programs without giving away what they were!) I couldn't decide which offer to accept. My letter to ASA Executive Director Fred Leone had asked for his advice about which one was the most applied program, but his diplomatic response left me no closer to a decision than I had been. Then one night at 9:30pm, Bill Harkness, the Department Head at Penn State at the time, phoned to offer me a fellowship in addition to the TA job. I was so impressed that a professor would call me at 9:30 at night that my decision was made. I suppose the additional support helped as well, but it was the evening phone call that really made the difference.

Once I got to Penn State I was surprised to discover that graduate study in statistics bore no resemblance to the course I had taken in my psychology major, which was my only previous exposure to statistics. I loved all of my courses (okay, *most* of my courses) and I particularly liked the interplay between theory and applications. One of the hot topics in statistics in those days was robust estimation, and my dissertation research expanded work by Peter Bickel on a robust, nonparametric method of estimation for multivariate location. I wasn't particularly excited by that topic though, and didn't stick with it after I received my Ph.D.

The best discovery during my graduate school days was how much I loved teaching. By the end of my 3rd year I was teaching my own large introductory statistics classes. When I first arrived at Penn State my teaching assistant assignment was to work for Bob Heckard, who was an advanced graduate student and lecturer at the time. He was a superb teacher – better than any I had had as an undergraduate, and I learned so much about how to teach by watching him. During those years I had several excellent teachers in my graduate classes as well, and a few other role models for teaching large classes. So when I was assigned to teach my own large classes I felt quite well-prepared to do so. Teaching energized me in a way that nothing else did. It still does!

Teaching Tips

AR: What was your teaching style in those days, and what are some tips or lessons that you picked up from Heckard and others?

JU: Well, there were the obvious things I picked up, like how to organize a lecture and the importance of using interesting examples. But there was something else, more subtle and harder to describe. This might sound wacky, but it has to do with affecting the energy in the room.

Anyone who has been in an energized crowd knows that there is a synergy that happens when everyone is focused on the same thing. So I learned to sweep in just before the lecture started, and sort of gather the energy of the audience and bring it to focus on the lecture. Of course technology has ruined all of that. There is no "sweeping in just before the lecture" when you have to spend five minutes setting up the computer, and there is no "gathering the energy of the audience" when they are all focused on their smart phones!

Back to the more mundane, I learned that the best way to introduce a new topic is to present an interesting example, but leave open a question that the new topic will help solve. Then explain how the new procedure works before closing the loop by finishing the example. If there's time, follow that with another example that uses the new topic and possibly some previous material.

I also learned how to handle logistics for large classes. For instance, if there is something to be handed out, prearrange the papers in stacks that correspond to the approximate number of students in each row. Then it's very fast to pass one stack across each row, then come down the other side of the room and make final adjustments. Other techniques I learned were how to return homework and exams efficiently, how to avoid students arguing over a few points, and how to discourage rude behavior in the classroom.

AR: Wait a minute. You can't leave us hanging there! I know you might prefer to close the loop by revealing your secrets at the end of this interview, but I'm very curious to know (and I bet I'm not alone) how *you achieve these things. In your last sentence you've put your finger on several issues that are a real thorn in the side of the best instructors. How* do *you return student work efficiently and avoid students' haggling over a few points, and discourage rude behavior? Maybe we can strike a deal: How about if you reveal one of your tips now, another at the midway point, and the final one at the end of this interview?*

JU: OK, deal! Let's start with how I handle haggling over points on homework and exams. Students aren't allowed to dispute any grading until the end of the quarter. (We're on quarters, so perhaps I'll start using "term" to mean quarter or semester.) At the end of the term I provide a cover sheet listing all of the homework assignments and exams. Any student who wishes to dispute points writes the number of points in question next to each relevant assignment/exam, along with a total for homework and for exams. (I need separate totals because one homework point has a different value than one exam point.) They then attach the cover sheet to their relevant graded papers, with a written explanation of why they think they deserve more points. These are turned in around the time of the final exam. *After* I have worked out what letter grade to give each student, I go through them and determine whether the student's letter grade would change if I were to give all of the points in dispute. If the answer is no then I don't even look at the disputed assignment(s). If the answer is yes, then I look very carefully to see if they can earn enough extra points to change their grade. (I warn them that they will fail the course if we discover that they have changed any answers, and that it will not help their case if they submit any frivolous requests.)

I like this system for a number of reasons, and the students like it too. First and most obvious, is that it saves all of us (students, teaching assistants and me) the hassle of haggling over a few points that are never going to matter anyway. Next, it provides "equal access" for students who

are too timid to approach us in person with their concerns. Third, if there is an issue with grading a particular problem or assignment that needs to be reconsidered, I have all of the student papers together and can make a universal decision for all students who had that concern. And finally, I have found that only a small proportion of the class actually turns in anything, and they tend to be the students who already have earned an A! I should note that I do allow students to ask questions about grading during the term, and the TAs and I are happy to discuss why points were taken off, but we make it clear that no grades will be changed until the end of the term. The one exception is if there is a mistake in adding up points, or some similar clerical error. Those are corrected immediately.

Early Career at UC – Davis

AR: Thanks, that does sound like a very effective system. I will hold you to revealing your other two secrets later in this interview. For now let's go back to when you finished your dissertation and left Penn State. What kind of position were you looking for, and what role did teaching opportunities play in deciding on your first faculty position?

JU: I was looking for an academic position, and was particularly concerned about joining a statistics department rather than a math department. I was afraid I would have to teach calculus! I wanted to be able to teach introductory statistics, but wanted to teach other applied statistics courses as well. At some of my interviews it became clear that the new junior hire would have very little say in what s/he was assigned to teach. But when I interviewed at UC Davis, it was very exciting. The statisticians were in the math department, but the job ad and the explanation during the interview made it clear that they were starting a statistics department and that it would be in business in the fall, which was why they were hiring. I thought that would be perfect – being in at the beginning of a new department, helping to develop curriculum and courses, helping to build the department, having input on who would teach what. They had hired John van Ryzin to be the founding department chair, and I was thrilled when he offered me the job. I turned down three or four excellent jobs in established statistics departments to embark on this exciting new opportunity. But the story doesn't end there!

That summer when I was packing the rental truck to move from Pennsylvania to California, I was finishing an article to submit from my dissertation research. I needed to put my affiliation, so I phoned the department manager in the Davis math department to find out if I should put "Math" or "Statistics" as my affiliation. She said "Oh, Math, of course." I asked her when the Statistics department would be official, and there was a short silence, followed by "I think you better talk to Frank Samaniego." I said "Shouldn't I talk to John van Ryzin?" and after a longer pause, the response was "You *really* need to talk to Frank Samaniego!" It turned out that John had left in June, the plans for a statistics department were on hold, and no one had told me! But it all turned out well. I spent my first year there in the math department, but after that the statistics department was indeed launched, and I was a founding member. And I never did have to teach calculus! (In fact it was launched as an Intercollege Division, having higher status than a department, and reporting to a group of five deans instead of a single dean. It was changed to a department many years later.)

The UC Davis Statistics Department website has a section on the history of the department, with extensive detail about the founding of the department. But the most fun part of it is that there are photos of the seven founding members, taken in our initial year as a department: http://www.stat.ucdavis.edu/about/history.

AR: That's quite a story! So, you did get to have a say in what courses you taught and in developing new courses. What were some of those courses that you especially enjoyed teaching and developing?

JU: Be careful what you wish for! In the years before tenure I taught 14 different courses. Our teaching load then was 5 courses a year (over three quarters), so I guess I taught 30 courses during the six pre-tenure years. I had some repeats, but every year I developed a few new ones, especially in the first few years when the department was just getting started.

Other than the large introductory course, which I've always enjoyed teaching, my favorite courses were the ones taught to graduate students from other departments. The students came from all over campus, ranging from psychology to veterinary science. They understood the importance of statistics and were so motivated to learn. We had great discussions, both in class and in more informal settings. I established lifelong friendships with some of the students from those classes, many of whom were older than I was. The courses I taught to that audience included an introductory course (for graduate students only), regression, anova, nonparametric statistics, multivariate statistics, and a two-quarter math/stat sequence. My least favorite course to teach was statistical computing for statistics graduate students. It was a new area, changing fast, and I had never taken a course in it. This was not a course in using statistical software; it was more like a course in developing software. I had to figure it all out on my own, and because the course was only taught every other year and computing was evolving rapidly, there was new material to be added when I retaught it. Fortunately, if I recall correctly, I only taught it twice before we hired someone who actually enjoyed teaching it!

Parapsychology Research

AR: Let me shift gears at this point to ask about your work in parapsychology research, for which you have achieved professional recognition and also media attention. How did you get started with that?

JU: First, some readers might not know what that is, so I'll define it. Parapsychology is the scientific study of alleged abilities such as telepathy and clairvoyance, collectively called psi abilities. What sets parapsychology apart from science fiction and wild anecdotes is that the research is done under well-controlled conditions and generally uses statistical methods to compare the results to what would be expected by chance.

When I first got involved in parapsychology research, I had just gotten tenure and was spending a sabbatical year in the Statistics Department at Stanford. I was looking for new research directions that would utilize my background in psychology, and had read a few news stories about work being done in parapsychology. I was intrigued by it, and also knew that Persi Diaconis (at Stanford) had written some criticisms of some of the work. Persi and I had some

good discussions about it, and he told me about a newly formed professional society started by a group of Stanford professors, called the Society for Scientific Exploration (SSE). The goal of the SSE was to create a community of scientists interested in studying various kinds of unexplained phenomena, along with a journal that would provide a reputable peer-reviewed outlet for their work. After talking with the SSE President, Stanford astrophysicist Peter Sturrock, I decided to attend their annual conference in Princeton, NJ. Ironically, at that conference I met two physicists (Hal Puthoff and Ed May) who were conducting government-funded research in parapsychology just a few miles from Stanford, at SRI International. They needed statistical help, and the rest is, as they say, history!

A few years later I took a leave of absence from UC Davis and spent a year as a visiting scientist at SRI, working on classified government-funded research in parapsychology. I've continued to be involved with parapsychology research, and still find it fascinating. The accumulated statistical results suggesting that these phenomena are real are quite strong, although the effect sizes are small. (Large effect sizes are obvious and don't require statistical methods to establish their existence.) I'm amazed that the general scientific community isn't more interested in investigating what's going on. As long ago as 1991, Persi Diaconis wrote in response to an article of mine in *Statistical Science* (1991, p. 386): "Parapsychology is worth serious study. If it is wrong, it offers a truly massive case study of how statistics can mislead and be misused."

AR: I'm curious about the state of parapsychology research now as compared to when you started with it. Is the government still funding such research? Are others funding it? You mention that the scientific community as a whole has not shown a lot of interest, but what kinds of scientists are involved? Would you say that more research is being done now than previously, or does the heyday appear to be in the past?

JU: There are lots of questions there! I don't think the government is funding research anymore - the government program I was involved with ended in 1995. Parapsychology has never had much funding, and it mostly comes from private foundations. The scientists involved come from a variety of disciplines, including psychology, physics and more recently, neuroscience. The geographic center for active research has shifted to Europe, especially the U.K., mostly because of an endowed Chair in Parapsychology at the University of Edinburgh. That program has produced dozens of Ph.D. graduates, and many of them have gone on to start research programs at other U.K. universities. Unfortunately there is still a stigma associated with doing research in parapsychology, mostly perpetuated by some strong deniers who use strategies like ridicule and selective focus on negative results. What young academic would want to put up with that? So there isn't a lot of incentive for young researchers to get involved. Recently the debunkers have actually attacked frequentist statistics in general, because the results in parapsychology appear so favorable using those methods!

One current line of research that I find interesting is what's called "presentiment." For these experiments, physiological measurements are taken over a continuous time period, during which participants are shown a series of pictures at randomly spaced times. Some of the pictures are disturbing and others are neutral. Physiology is compared for the few seconds just *before* the pictures are shown, and it appears that peoples' physiology is actually anticipating when a disturbing picture is about to be shown, compared to when a neutral picture is about to be shown.

Perhaps an artifact will be found in the experiments or analysis, but so far no one has been able to find one, and not for lack of trying. If any psi abilities are real, this one makes sense because I think there would be an evolutionary advantage to having a physiological jolt when something disturbing or dangerous was about to happen. That would probably be even more advantageous than consciously knowing something bad was about to happen, which may result in freezing in fear.

What I think is more relevant to statisticians is that if the results in parapsychology are real, and I think they are, then we should be concerned about how they might be affecting experiments in other realms as well. For instance, is it really possible to do a double blind experiment if people can somehow know things without being told? Some experiments in parapsychology have shown that true randomization may be impossible. The reasoning is too complicated to explain in this short space, but these results suggest that the person doing the randomization might be able to peek into the future and randomize in a way that produces favorable results. You may have read some of the recent debates on why so many experiments in medicine and psychology are not replicating the way statistics (such as power analyses) predict they should. We know that there is an experimenter effect in general, which is why we use controls like placebos and double-blinding. But what if there is an additional experimenter effect caused by psi? Then there would be no such thing as an objective replication, or even an objective experiment. That's one reason I think statisticians (and other scientists) should be paying more attention to the results in parapsychology.

AR: Your work in this area led to some media appearances, on the Larry King show and elsewhere. How did those come about? What have you learned from those experiences about communicating through popular media?

JU: My first media appearance was on ABC's 20/20, the year I was on sabbatical at Stanford. Persi Diaconis had been asked to evaluate and discuss a study that seemed to show that commuter train ridership was lower than expected on days when trains were in accidents. Persi asked me if I wanted to do the analysis and TV appearance instead of him, and I agreed. I noticed that the accident days included a Monday that happened to be Labor Day, but in the analysis the ridership was predicted as if it was a regular Monday. So my first TV appearance was as a debunker!

In the summer of 1995 Congress decided to declassify much of the work it had funded in "remote viewing," colloquially named "psychic spying" by the media. I was asked to work with a well-known skeptic, Ray Hyman, to investigate this work and recommend to Congress whether psi abilities had been scientifically established, and whether they were useful for intelligence work. Ray and I agreed that there were statistically significant results that couldn't be explained, but he stopped short of attributing them to psi, instead speculating that there must be some other explanation (but not providing one). We also agreed that there certainly must be much more reliable methods for gathering intelligence! No one is arguing that psi abilities are strong – if they were, we wouldn't be debating their existence.

Our report was finished in September, but was indefinitely embargoed until it was finally leaked to ABC News just before Thanksgiving. By that time both Ray and I had been working with our

university media offices to prepare for the publicity they predicted would come from the release of the report, and our media offices had been working together on a press release. It turned out they were right about the media interest, so we had our week of fame, appearing first on ABC's Nightline, then a series of other shows. By the time the Larry King show called I was so tired of interviews that I almost said no! But the UC Davis media office convinced me to do the show.

The timing of the 1995 report coincided with my appointment to the administration at Davis, first as a faculty assistant to a Vice Provost, and then as an Associate Vice Provost. So I had already been scheduled to take a media training workshop but hadn't done so yet. When the networks showed up I was given a crash course! I learned so much about how to work with the media from that experience, and my contact in the UC Davis News Service was fantastic. I guess the main lesson I learned is that the popular media has a completely different set of priorities than we do as academics. They want to attract an audience, and aren't interested in long explanations and caveats. So I learned how to be very concise with my answers. And anyone who has attended an AP Statistics rubric training will appreciate the other main lesson I learned, which was "Repeat the question!" Unless the interview is live, you can assume the media will take answers out of context. So I learned to always include the question as part of my answer. The most frustrating part was not being able to give lengthy explanations. I have a much better understanding of the pressures people are under when they do television interviews.

AR: Your plenary talk at the Eighth International Conference on Teaching Statistics (ICOTS-8) in Slovenia focused on statistics teaching issues raised by research in parapsychology. You included Bayesian analysis among the topics that can be studied effectively with parapsychology examples. Have you used this context much in your own teaching? How have your students reacted to it? Are students fascinated by this research, or are they cynical and dismissive, or do their reactions run the gamut? I hope you won't say that they are bored!

JU: I haven't had a chance to teach the Bayesian analysis part except for a brief mention. I always devote one lecture in my introductory statistics class to some of the research in parapsychology. It's a great way to show a practical application of hypothesis testing, confidence intervals, meta-analysis and the binomial distribution. Students are intrigued, and have much the same mixed reaction as the audience did at ICOTS and elsewhere when I've talked about this research. Most people are quite surprised to learn that careful research has even been done! But in spite of the convincing statistical evidence, I don't think anyone changes their minds about the reality of psi based on the data. I point that out to the students, and then discuss the basic idea of Bayesian methods, in which strong prior probabilities can carry more weight than data.

My favorite teaching experience in parapsychology was a 4-unit first-year honors seminar I taught three or four times at Davis. It was part of a turn-of-the-century theme in the campus-wide honors program there, so I called the class "Testing Psychic Claims: From Séances to Statistics." The idea was that in the late 1800s people were trying to prove that psychic abilities exist through séances. But by the late 1900s, all of that had been replaced with statistical studies. The class was lots of fun. I brought in a psychic who had (allegedly) worked with the Davis police department, and also brought in a magician who could fake psychic abilities. The students did team projects in which they had to design their own studies and analyze the results using statistics. One project even led to a publication in a parapsychology journal. It was a dream study

in which the team members were supposed to try to dream about randomly selected pictures, then reach consensus as a team about which one was the actual target. It worked well enough (over many nights) to achieve statistical significance! I was very fortunate to be able to hire an assistant for that course who has a PhD in parapsychology from the University of Edinburgh, and she helped the students design proper experiments. It was great fun, and I think they learned some statistics too!

Later Career at UC – Irvine

AR: That does sound like a unique and fun class. You've since moved on from UC – Davis to UC – Irvine, where you now chair the Statistics Department. What prompted your move, and what's different about your position in Irvine?

JU: I wasn't looking for a new job, and the details about how the opportunity to move to UC Irvine came about are too complex to describe here. Once the opportunity was there it took me a long time to decide – 3 years (!), one of which I spent on sabbatical at UC Irvine. It was obviously a difficult decision, but there were a few influences that finally prompted me to accept the offer. The most poignant was a conversation with a statistician friend who had recently changed jobs after a long time at one place. She said she knew that if she didn't take the new job when it was offered, then she would almost certainly never move and would finish out her career at one university. That got me thinking about the finiteness of a career and life, and I realized that the same would be true for me. I didn't like how that felt, even though I loved UC Davis and the work I was doing there. At the time, I had a half-time administrative position as director of the campus honors program. I had served in other administrative jobs at Davis as well, including a term as Director of the Women's Studies Program early in my career, and a four-year term as an Associate Vice-Provost. (Ironically, I had never been department chair at Davis!) So after 30 years I decided it was indeed time to move on.

The UC Irvine Statistics Department was still relatively new when I moved, and I thought it would be fun to help establish another new department, this time as a senior faculty member rather than as a new assistant professor. And it has been fun! I became department chair at the end of my third year, a year after the founding chair, Hal Stern, became our dean. My colleagues in the department are all fantastic statisticians and human beings, and we have a wonderful camaraderie. (I guess I should mention that one of them is my partner, Wes Johnson, who moved to Irvine when we were first offered the jobs in 2005.) Unlike Davis, we don't have an undergraduate major yet, but we have Masters and PhD programs, and we teach the usual array of service courses. So the teaching and graduate student interactions are similar to Davis. The Department has a somewhat unique placement in the school of Information and Computer Sciences rather than with the natural sciences, and our graduate programs emphasize cross-disciplinary expertise. I consider myself an applied statistician, so the Irvine department is actually a more natural fit for me than the Davis department, which tends to emphasize theory.

AR: I want to ask more about your experience at Irvine, but I can't let you slip by with that mention of directing the Women's Studies program at Davis. How did you come to that role? What was that experience like?

JU: I hate controversy, but I seem to have a knack for stepping right into the middle of it. When I first arrived at Davis the proportion of faculty who were women was very low; I think it was between 10% and 15%. One of the women in psychology had the bright idea of forming a group called the Faculty Women's Research Support Group. All women on the faculty were invited, and we met once a month in someone's home – that's how few of us there were! Each month one of us would present her research in a way that the rest of us could understand. So I got to know women from all across campus, and something about what kinds of research they were doing.

The controversy came when a proposal to form a Women's Studies Program was presented to the Academic Senate. Women's Studies was a new academic discipline at the time, and it's hard to understand now why it was so controversial, but there were people who didn't think it was appropriate for universities to be teaching courses like women's history and the psychology of gender. There was a small but vocal group of faculty opposed to the idea of starting the program, which resulted in an organized campaign to defeat the proposal during the Senate meeting where the vote was to take place. I was our departmental representative to the Senate at the time so I was recruited by the "pro" side to make a crucial "second" to the motion proposing the major. The proposal passed overwhelmingly, and somehow I was pulled into the organizational process of setting up the major. That led to my appointment as director.

The experience was lots of fun, and gave me my first taste of administration. I had two major roles – one official and one unofficial but crucial. Because it was a program and not a department, the official role was to recruit faculty from various departments across campus to teach the courses. Most of that was easy because the courses resided in those departments (women's history, literature by women, and so on). But there were a few actual "Women's Studies" courses and I had to get creative to find ways to have them taught, which sometimes meant hiring lecturers. That brings me to the unofficial role, which was managing the politics of a controversial program. I got a call one day from the Vice Chancellor telling me that the Women's Studies students were picketing the administration building, and I needed to get over there and stop them! It turned out that the home department of one of the popular lecturers had decided not to rehire her, and the students were furious. They saw it as an attack on the Women's Studies Program, because most of the courses this lecturer taught were part of it. Fortunately I had excellent rapport with the students, and was able to negotiate a meeting between the student leaders and the administration in which we worked through the problems. Some of the friendships I established with the students continue to this day. So overall, it was a very rewarding experience.

AR: Boy, you do have some good stories! Speaking of controversy, let me ask about your relationship with Bayesian statistics. You mentioned that the founding chair of the Statistics Department at Irvine was Hal Stern, an ardent and vocal advocate of Bayesian statistics, and Wes Johnson is also a well-known Bayesian statistician. I recall that your plenary presentation at ICOTS-8 in Slovenia had a substantial Bayesian component. How do you view your relationship with Bayesian ideas and methods, first as an applied statistician, but also as a statistics educator?

JU: I'll address that in three parts, and will probably be walking right into another controversy by giving answers that neither my Bayesian nor frequentist friends will wholly support! First, I

think Bayesian methods are ideal for applied work if you truly do have prior knowledge and/or expert opinion available. Wes Johnson likes to use the example of estimating the prevalence of HIV in a community. Certainly no one really expects it to be equally likely to be anywhere from 0% to 100%, and experts on the topic could be used to elicit realistic prior information.

Prior opinion is especially relevant for some of the work I've done in parapsychology, but what many non-Bayesians don't understand is that there are two different places where prior information is required. One is in specifying prior odds of the null versus alternative hypotheses, but the other, more subtle, is in specifying a prior distribution on the size of the effect if the alternative hypothesis is true. There was a controversial exchange of articles a few years ago in a major psychology journal, in which unrealistic priors were used to try to refute a frequentist analysis showing that precognition may be possible. Of course in an area that has small effect sizes if you ask the data to decide between no effect and gigantic effects, the data will support no effect. That's what happened in this case. The use of priors putting most of the probability on unrealistically large effects led to Bayes factors strongly supporting the null hypothesis (no precognition). Wes and I teamed up with the psychologist whose work was being attacked (Daryl Bem) to show that more realistic priors led to strong support of the alternative (precognition) hypothesis. As we pointed out, no one should believe that if psi abilities are real the effect sizes are large. Large effects are obvious to the naked eye, and as mentioned earlier, if psi effects were large there would be no controversy about whether they are real.

The second part I'll address is education of graduate students. I think anyone getting a degree in statistics should have at least one course in Bayesian analysis, and ideally more. I know most statisticians see the Bayesian-frequentist divide as philosophical, but my opinion is that all of our data analysis tools are just that – tools to be used as appropriate to the situation. So I think that with both Bayesian and frequentist methods, the most important training a statistician can receive is an understanding of how to utilize our array of tools and interpret the results. The same applies to graduate students from other departments who will need to use statistical tools for their own research. I've served on many oral qualifying exam committees across campus, and my favorite question is to ask the student to interpret a *p*-value. Even when I give them advance warning that I'll ask, most of them are not able to do it. The recent attacks on "null hypothesis significance testing" in prominent psychology journals just underscores my feeling that we need to do a better job across the board of teaching students to understand our methods.

The third part of my answer is about introductory statistics courses. In that case, I think it's important to mention Bayesian methods, but not to go into any details, unless the entire course is going to be taught from a Bayesian perspective. It's just too difficult for students to shift their thinking from considering parameters as fixed to thinking of them as something for which you can quantify uncertainty in the form of a distribution. And of course I'm not a big fan of teaching students how to *do* statistics in the introductory course in any case, especially if that's the only course they will have.

AR: That last comment is one that I'll definitely follow up on. (Yes, I just ended a sentence with two prepositions, which may hard for some readers to put up with. Oh no, I just did it again!) But first, I suspect that we're nearing the halfway point of this interview. Earlier you told us your secret to avoiding students' haggling over points. You agreed to also enlighten us about

how to return student work efficiently and how to discourage rude behavior in class. Take your pick, and save one for the end.

JU: Let's take returning student work first, because with technology changing so fast my method might be outdated by the end of the interview! In fact my method is probably already outdated, but I'll share it anyway. Remember those things called manila folders, which we used to file papers before everything was electronic? Well they are very useful for returning homework and exams. If you turn them sideways and staple up the sides, you've created a sort of sturdy envelope that's about 11 inches across and 9 inches high. I ask students to write their name at the top of their paper, and ask my graders (and myself) to write grades at the bottom of the paper. Then if you insert the papers into the stapled folder, the top two inches stick out the top, enough for the students to see their names, but no one can see the grades. I alphabetize the papers to make it easier for them to find them quickly. (Unfortunately I'm finding that fewer and fewer students actually understand what "alphabetical" means – I told you the method was outdated!) For large classes, up to 200 or so, I divide up the alphabet into about 5 parts and create a folder for each one. For homework I usually pass them around during class, but for returning exams I place them on the chalk (aka whiteboard) tray at the front of the class and students line up for their part of the alphabet. It takes only 5 or 10 minutes to return 200 exams that way, and less time for smaller classes.

Textbook Writing

AR: Very clever, thanks. Now I want to return to your very intriguing comment that students should not learn how to do *statistics in their first course. You wrote* Seeing Through Statistics *(2015) with this in mind, right? The obvious question for me to ask is: Well then, what* should *students be learning in their first (and for a large majority, their only) statistics course?*

JU: Yes, I wrote *Seeing Through Statistics* because I was fed up with hearing how much people hated the one statistics course they were required to take in college, and how useless they found it. Also, I watched my mother and sister struggle through the introductory statistics courses required for their degrees in social work, and I realized how silly it was that they were learning how to calculate standard deviations and do *t*-tests. Instead, they should have been learning how to understand things like risk (a big issue in social work), when cause and effect can be concluded from a study (almost never in social work), how to interpret the kinds of graphs they might see, and so on. (In fairness, my mother actually did have a great experience with a statistics course taught by Harold Sackrowitz at Rutgers specifically designed for her MSW program.)

Obviously it would take more space than we have to list all of the things I think should be taught, and I've written books and papers on that, so I'll just talk about my philosophy here. It's two-fold. First, no one is equipped to actually do statistics after a single course, any more than I was equipped to be a surgeon after the biology lab where we had to dissect a frog. So we should not be trying to teach them how to do statistics if they are only going to take one course. They can learn that in their subsequent courses, if relevant. And second, if students don't come out of their introductory statistics course with at least five (to randomly pick a number!) ideas they can use in their lives and/or careers, then I think we have failed them.

I do think we need to acquaint them with the *ideas* of inference, including confidence intervals and *p*-values, but it can be done in a way that is less technical than what we tend to do now. For instance, almost everyone comes into the course having heard the term "margin of sampling error" so it's easy to motivate the idea of a confidence interval by talking about election polls and other surveys. We can get across the importance of sample size by using a conservative margin of error of $1/\sqrt{n}$, which is what they are likely to see reported anyway. There's no reason they have to then learn about using 1.96 instead of 2, and also no reason for using something other than ½ for the proportion used to calculate margin of error. I realize that part of the problem is that other departments expect us to teach the technical material, so I don't follow my own advice as closely as I would like! But I do give prominence to the ideas rather than the technical details.

There are lots of examples of the kinds of ideas students can use in daily life. For instance, I teach them to evaluate whether or not an extended warranty is a good idea for them personally. This involves two big ideas – expected value and individual differences. Of course the company offering the warranty is coming out ahead averaged over everyone who buys it, so you have to decide if you are a special case who, unbeknownst to the seller, is actually at much higher risk of needing an expensive service during that time period. If you've already dropped and destroyed three cell phones, you might consider an extended warranty. If you live 100 miles from the nearest appliance repair person but the warranty includes free house calls, it's probably also a good investment. But if you're the kind of person who is meticulous about your belongings, then they are likely to make money on you.

Other examples are common and probably familiar to readers anyway, so I'll just mention a few quickly. A recent study showed a positive association between amount of coffee consumption and life span. Many of the resulting headlines promoted coffee as a cause of longer life, ignoring the more likely possibilities of confounding variables and not adjusting for multiple analyses. (Coffee was not the only food/drink tested.) Another recent study made big headlines by claiming that obesity rates for toddlers had decreased substantially in the past decade. But it turned out that there had been a temporary increase about 10 years ago, and if a longer timeline was used, the rates had remained relatively flat except for that short-term blip. It also turned out that the study had not adjusted for multiple analyses, even though they looked at several age cohorts and the 2 to 5 age group was the only one that showed a statistically significant decrease. And of course no one should leave their introductory statistics course without knowing that the conditional probability of having a disease given that you have a positive test is not the same as the conditional probability of a positive test given that you have the disease. That would save people a lot of worry. Oops, I said I was going to talk about philosophy rather than specifics! So I'll stop, or we'll never get past this question.

AR: Let me point out that Utts (2003) and Utts (2010) are two articles in which you've written about what you want all educated citizens to learn in a statistics course. Next I will ask about your other textbook, Mind on Statistics, *which you've co-authored with one of the Penn State faculty members you mentioned earlier, Bob Heckard, now in its fifth edition (Utts and Heckard 2015). How is this different from* Seeing Through Statistics*?*

JU: There's one more relevant paper titled "What your future doctor should know about statistics: Must-include topics for introductory undergraduate biostatistics," co-authored with my colleague Brigitte Baldi, but it's only available in the 2013 JSM Proceedings. We're currently updating it to submit to a journal. Back to your question: Bob and I wrote *Mind On Statistics* (MOS) as a compromise between teaching what I think is important for an introductory course and teaching what other departments on campus want their students to be taught. We started with *Seeing Through Statistics* (STS) as the core, and added formulas and more technical details. But the basic ideas woven throughout STS are also there in MOS. Unfortunately most schools don't have a separate introductory course that doesn't require formulas, so writing MOS was my way of trying to expose students to the material useful in daily life, while still covering the required technical material. If students read only the first and last chapters of MOS they would be well ahead of most people in understanding how statistics impacts their lives. Chapter 1 is called "Statistics success stories and cautionary tales" and Chapter 17 is called "Turning information into wisdom." Both chapters focus on examples that teach ideas relevant to daily life. The rest of the book just fills in the details!

AR: You make it sound like writing Chapters 2-16 was the easy part! You've reminded me of what an English teacher in high school told my class: She said that she would read the first paragraph of an essay, and then she would read the last paragraph, and then only if those captured her attention would she read the rest.

Let me ask next about CyberStats*, the electronic textbook that you played a lead role in developing. Please tell us about that project, including what motivated you to work on it and what you learned from the experience.*

JU: The mastermind behind CyberStats was Alex Kugushev, who founded Duxbury Press. I can't remember exactly when we started the project, but it was sometime in the late 1990s. Alex was ahead of his time, and was convinced that online education was going to be the next big thing, even equating it to how the printing press changed reading and education for the masses. So he recruited me to work on it. But it soon became clear to both of us that creating a comprehensive online learning environment would require a large team. This was before internet speeds were fast enough to handle video, and we saw three main ways in which online learning was superior to a textbook: (1) interactivities like applets, (2) practice problems and quizzes with immediate and substantial feedback, and (3) links like pop-up definitions and referrals to other places a topic or example were discussed. But all of those required lots and lots of pages to be created, so we decided that I would be "editor-in-chief" and Alex would recruit other statisticians to create some of the content. I created a shell for each unit so that there would be consistency across all of them, and Alex did indeed recruit people to write content. We ended up with 39 units and several case studies written by over a dozen authors. At one point, I counted the number of files that were part of CyberStats to be more than 7,000!

But Alex was indeed ahead of his time. Very few institutions had resolved how to handle online courses in the late 1990s, and Alex refused to put CyberStats on a CD because he was afraid (probably correctly) that it would be illegally copied and distributed. So sometime around 2003 Alex sold it to a large publisher, and they shelved it. I'm still sorry we let it go, because I think it was a very valuable learning tool. I used it in a hybrid class I taught and about half of the

students preferred it to a textbook. (I used both for the class because not everyone had good internet access back then.) It was also cheap compared to a textbook. I think it was $15 for students to get a subscription for a course, and it even included a course management system for the instructor, before they were widely available.

AR: Am I right that this hybrid course that you mention led to your JSE *article on that topic (Utts Sommer, Acredolo, Maher, and Matthews 2003)? Can you summarize your findings from that study for us?*

JU: Yes, the hybrid course I taught was developed as part of a larger study of online and hybrid learning conducted by a research team at UC Davis. I simultaneously taught a traditional offering of the introductory statistics course, and we compared the two offerings on a variety of measures including student performance and satisfaction, and time spent by the instructor. The overall finding was that all of these measures were similar for the two offerings. But there were differences in some specifics. One example relates to the amount of time spent by the instructor. The research team provided me with a weekly timesheet (online, of course!) to fill out for each course with specifics about how I spent my time. Although both courses took about equal time, the hybrid course had weekly quizzes, and much of my time was spent writing those, whereas writing and delivering lectures were the most time-consuming activities for the traditional course. In the long run, I think the hybrid course would take slightly less time because there were no lectures, and eventually I would have a pool of quiz questions.

Of course we could not randomly assign students to the two versions, so there may have been some issues of differing motivation for the two groups of students. But we did give them pretests and had some background data on them, so I'm fairly confident that on average, students would do equally well in either course.

The article was based only on the first offering of the hybrid course, but I continued to teach it for a few more years and learned a great deal about the best way to offer it. The course met for 80 minutes once a week. Between meetings, students were given a one-page set of instructions on what to read, what applets to try, and what homework problems to do. I kept that format for all the offerings but what changed was how I used the 80 minutes of class time. In the first offering I still hadn't quite given up the idea that what we as instructors do best is lecture! So I would give a quiz, then a short lecture on what was coming in the week ahead. Bad idea! What I eventually learned is that students can understand the majority of the material reading it on their own, and I was wasting their time by lecturing on it ahead of time. The format I eventually evolved into as most beneficial was as follows. Homework was due at the beginning of class. (This prevents class time from deteriorating into a homework help session.) There was a quiz during the last 30 minutes of class. And the remaining time (the initial 50 minutes) was a question/answer session. But rather than just answering the question asked, I would use the questions as a guide to what students most needed me to explain. Then I would give a mini-lecture on those topics. I had almost perfect attendance, so I think the students appreciated that format as well.

Professional Service

AR: Let me shift gears a bit and ask about some of the administrative and service role you have fulfilled. You have chaired the Committee of Presidents of Statistical Societies (COPSS). Please tell us what this organization is and does, and what your role as chair entailed.

JU: COPSS is probably best known for the five awards it gives, the most prestigious of which is the "under 40" Presidents' Award, first given in 1979 (to Peter Bickel). The Fisher Award and Lecture is also given by COPSS, as are the Snedecor Award, the Elizabeth Scott Award and the F.N. David Award. But the behind-the-scenes work COPSS does is equally important, and includes discussions among the North American professional societies, with the goal of sharing information and coordinating activities. The presidents, presidents-elect and immediate past presidents of ASA, ENAR, WNAR, IMS and SSC (Statistical Society of Canada) are all included, and more recently representatives from other organizations have been invited to participate in the annual COPSS meeting, held at JSM. The COPSS Chair is appointed by the presidents of the five societies for a three-year term, in my case from 2007 to 2009. The Chair oversees the various COPSS activities, including administration of the awards.

I was surprised to learn recently that COPSS is over 50 years old! There's a nice history of it written by Ingram Olkin in the new book *Past, Present and Future of Statistical Science* (Lin et al., eds. 2014), which was commissioned by COPSS in celebration of its 50th anniversary and the International Year of Statistics. The book can be purchased in paper form, or downloaded for free (http://nisla05.niss.org/copss/past-present-future-copss.pdf). As described in the history, two activities that continued for a long time were the Visiting Lecturer Program and the Careers in Statistics booklet. Both programs were designed to address the shortage of statisticians, which seems to have been an ongoing problem for longer than I realized. I participated in both of these activities long ago. Maybe it's time for COPSS to resurrect them!

AR: As this interview is being conducted, it was just announced that you have been elected President of the American Statistical Association for the year 2016. Congratulations! Please tell us about what you would like ASA to achieve during your upcoming presidency.

JU: Thanks! I have lots of ideas, and if I can just bring a few of them to fruition I'll be happy. And of course I hope I'll get some new ideas as a result of input from the membership. But right now, most of what I hope to accomplish is related to statistics education, broadly defined. One idea is to connect ASA with high school AP Statistics teachers to get information on careers in statistics into the high school classrooms. High school students are learning how to do statistics, but I doubt if most of them realize what a great career opportunity statistics can be. Another idea is to provide media training for any ASA member who is interested. There could be multiple benefits to that. First, more of our colleagues could inform the media about what they do in a way that would interest the public. Second, I hope more statisticians would come forward to respond to some of the misrepresentations of statistics in the media. And third, if more statisticians were comfortable talking to the media then perhaps journalists would be more cognizant that they could rely on statisticians for interesting material. Those are just a few specific ideas. In general I'm interested in furthering public understanding of statistics and what statisticians do. I think it's been awhile since there was an ASA president whose main focus was

statistics education, but the ASA staff has been wonderful in implementing education-related programs. I think the infrastructure is there within ASA to accomplish quite a bit.

AR: Those plans sounds terrific, and I'm sure that you can rely on the support of many JSE *readers to help with implementing them. You mentioned AP Statistics in there. You've been involved in the leadership of AP Statistics for many years, including as Chair of the Test Development Committee that writes multiple forms of the exam every year. Starting in July of 2014, you will assume the role of Chief Reader for the program, meaning that you'll be responsible for the grading of all those exams. You clearly have many professional interests, and like all of us you have only a finite amount of time to pursue them. What about the AP Statistics program has enticed you to devote a considerable amount of your professional time and energy to serving in its leadership?*

JU: That's easy to answer! It's the community of people who are involved. Anyone reading this who teaches introductory statistics but hasn't been involved in the AP Statistics program should consider getting involved. The camaraderie at the Reading is wonderful, and the professional development that occurs from interacting with so many intelligent people with common interests and goals just can't be matched anywhere. When I first got involved as a member of the Test Development Committee (in 1997), I had been teaching for over 20 years, and I thought I knew how to write and grade test questions. Yet I have learned so much more about how to do those things from my AP experience.

And you're right; I'm counting on the Statistics Education community (including *JSE* readers) for help and support during both my term as ASA president and my term as Chief Reader. In fact anyone who is reading this now who has ideas and suggestions related to either of those jobs should send them along!

Pop Quiz

AR: Now let's begin what I call the "pop quiz" portion of the interview, where I'll ask a series of questions that I'll ask you to answer with just a few sentences. First, please tell us about your family.

JU: That's supposed to be a quick one – ha! Of course I could go on for a long time about them, and genealogy is one of my hobbies so my family tree on ancestry.com has over 10,000 people in it. But, I'll stick to the basics: No kids; my partner Wes Johnson is also a statistician. My parents are both deceased, but my father was a journalist (and a very creative writer). My mother was a social worker, as are two of my sisters and a brother-in-law, so we call social work "the family business." My third and youngest sister is deceased. I have one younger brother, who has his own business. I happen to be answering this on Mothers' Day, so I'll mention that my inspirations were my maternal grandmother and my mother. My grandmother was allegedly the first kindergarten teacher in Pennsylvania. She died when I was only five, but I remember her teaching me how to count by using coins, and I remember enough to know that she must have been a wonderful teacher. My mother was smarter than I am and would have loved to be an academic, but lived in a time when that wasn't easy for a woman. I think she guided me to live the life she would have liked to live. And finally, I have close relationships with my nieces and

nephews, especially with two nephews who grew up in Davis and thus I was able to be part of their daily lives. They're both in college now (and both taking statistics this semester, with one of them using *Mind On Statistics*!).

AR: Does your nephew ask for help from the author of his statistics book?

JU: Yes! But he's just like most other students – he waits until the night before the exam!

AR: I was planning to ask next about hobbies. You've already mentioned genealogy as one of your hobbies, so let me ask specifically about that, and I'll waive the expectation of a short answer for this one. How did you get started with genealogy, why do you find it fascinating, and what have you learned?

JU: My two main hobbies are genealogy and traveling, and one thing that makes both of them more fun is combining them! I've been to visit places my ancestors lived in Sweden, Germany, England, Ireland and parts of the United States. I got started with genealogy as a diversion when I was working on my dissertation at Penn State. Both sides of my family were in Pennsylvania in the 1700s, and the Penn State library had an excellent collection of resources for Pennsylvania genealogy. I also visited some of the places in Pennsylvania where they had lived and were buried, and met some very elderly distant relatives who lived close to Penn State and had lots of family history information. It was a great way to take a break from working on my dissertation. After that, I abandoned genealogy until the internet came along and made it easy to find information without having to leave home. One problem with the internet is that there's lots of incorrect information out there, so it becomes a sleuthing exercise to sort out what's correct. The latest development is DNA testing and matching. I've been able to solve some long-standing family history mysteries through DNA matches.

Genealogy is actually a lot like other forms of research. Sometimes it's tantalizingly easy to make connections and go back several generations, and in other cases it requires pain-staking attention to details and creative problem-solving. It's also great fun to meet distant relatives via email through a common interest in genealogy, and I've even met (in person) some second cousins I knew about but wouldn't have known how to locate. They found me via my online family tree. And finally, it's fun to discover relationships with famous people, like my 5^{th} cousin twice removed (President) Gerald Ford and my 11^{th} great-grand uncle (Governor) Thomas Mayhew, who founded Martha's Vineyard. My most recent interesting discovery is that statistician Bill Eddy and I are 9^{th} cousins. And then there are the skeletons in the closet… but I won't go into detail about them!

AR: What are some books that you've read in the past few months?

JU: My favorite genre is historical novels. I recently finished a series of six books by Sara Donati that followed a family in the New York frontier during the late 1700s and early 1800s. Now I'm reading "Caleb's Crossing" by Geraldine Brooks, loosely based on my Mayhew ancestors (Mayfield in the novel) who founded Martha's Vineyard in the 1600s. I have to confess that I have a hard time reading most non-fiction books. I have a somewhat large stack of those waiting

to be read. They sound interesting, but I find that I start them and don't finish. I guess I like to escape reality when I read, not be reminded of it!

AR: What are some of your favorite places that you have traveled? Perhaps you could mention one trip that you took for professional reasons and another that was purely for pleasure.

JU: You ask hard questions! I've been to every continent except Antarctica (on my bucket list!) and all but three of the states in the U.S. (not on my bucket list) and have loved almost all of these trips. Most of the trips I take combine work and pleasure, so I'll answer with a somewhat different categorization. My favorite "comfort food" destinations – those in which I'm pretty sure things will go smoothly and be relaxing – are England, Scotland and New Zealand. Two destinations that I was a bit apprehensive about but that I thoroughly enjoyed were two of the ICOTS locales – South Africa and Slovenia. I don't think I would have chosen them on my own, but I was so pleasantly surprised with both of them. And finally, my favorite way to travel is to meet up with friends and colleagues who live in the places I'm visiting, and I've been very fortunate to be invited by statistics education colleagues to Japan, Australia, New Zealand, Chile and several places in the United States. I'm open to more invitations!

AR: What's your favorite airport, and do you prefer aisle or window?

JU: I like my local Orange County airport (aka John Wayne, Santa Ana, SNA) except for the cost of parking. It's small but has lots of food options. For transit airports I like Atlanta and Amsterdam, but don't like Heathrow, Paris or Minneapolis because of the ease (or not) of changing flights. And definitely aisle! I would rather have to get up for someone else than ask them to get up for me, and I don't sit still for long. I'm usually up every hour or two, even if just to walk the aisle.

AR: Let me ask a series of questions on which I sometimes collect data from my students, involving binary, categorical, discrete, and continuous variables. I'll start with: Would you call yourself an "early bird" or a "night owl"?

JU: Definitely a night owl. I usually force myself to go to bed between midnight and 1:00am if I have to be at work in the morning, but on weekends often stay up to 3am or so.

AR: I knew about your night owl tendencies from the times that you send responses to these interview questions! Next up: Do you use a Mac or PC?

JU: I use a PC. My first encounter with a Mac was not good. It was when I was in the administration in Davis, working with the Graduate Dean on something using her Mac. I pushed the button that was in the location used to eject a floppy disc on a PC, but on the Mac it was the button to turn it off. We lost what we had been working on. I still can't figure out how to use a Mac.

AR: On what day of the week were you born? (You can use www.timeanddate.com to produce a calendar for your birth year.)

JU: Saturday, around 5pm. Our family doctor was a bit perturbed with my mother for interrupting him during a football game to come and deliver me. Good thing he didn't stay for the next touchdown though, because he said I would have been dead if I had been born 5 minutes later. I spent my first 24 hours in an incubator.

AR: How many Harry Potter *books have you read?*

JU: How many are there? I've read them all. My nephew passed them along to me and I read them and gave them back.

AR: You've read all seven then. How many miles do you live today from where you were born? (You can use www.distancefromto.net to calculate this distance.)

JU: Thanks for the link! It's 2554 miles in driving distance, and 2178 miles in air distance. I was born in Niagara Falls, New York.

AR: Here's another question on which I collect data from students, a fanciful one: Suppose that time travel were possible, and you could take one trip. You can only observe, not change anything, when you get there. Would you travel to a time in the past or in the future? (Go ahead and explain your answer for this one.)

JU: I think I would travel about 100 years into the future. I'm very curious about what the status of lots of issues will be by then, including education, global warming, human rights, sources of energy, family composition, the status of nations, and so on. I'd also like to know if the results we're seeing in parapsychology are real and will be understood, or are mistaken and will have been disproved. I have great faith in human ability to solve problems, so I expect the world to be a better place in 100 years. And I have great faith in the human spirit, so I expect that the problems that can't be solved will be accommodated and accepted. I suspect that more than 100 years ahead would be too much – I probably wouldn't recognize anything!

AR: That surprises me a bit. I would have expected you to choose the past, considering your interest in history and genealogy. Back to reality in the present: What is your favorite course to teach?

JU: In fact I did debate whether I would prefer the past of future, for exactly the reason you stated. But I decided that the past can be at least partially known through existing records, while the future cannot. Back to the present: My favorite audience is graduate students from other departments who want to learn more about statistics. They are so thankful when they finally understand something, and they already know why statistics is important. I also enjoy teaching introductory statistics, but I don't have the luxury of teaching that to fewer than 200 students at a time. So sometimes it feels more like I'm giving a performance than a lecture. That's not an ideal learning environment. I do what I can to get them involved, such as using clickers in class, having them do hands-on team projects in the discussion sections led by teaching assistants, and having lots of office hours, but I wish I could have more individualized interactions with them. At Davis I taught a course from *Seeing Through Statistics* to classes of 30 to 50 students and enjoyed that very much. But we don't have the resources to offer that course at Irvine.

AR: I think you've already revealed some surprises in this interview, but one of my standard questions is to ask for something about yourself that you expect will be a surprise to most JSE *readers.*

JU: I once had dinner with the Prince of Liechtenstein. He was the Crown Prince at the time (meaning he was in succession after his father) but his father died shortly after that and he took over. He gave me his card and it had his name as Hans-Adam von Liechtenstein, and his address simply as "Schloss Valduz, Liechtenstein." (Schloss is Castle in German.) We communicated a few times after that by letters and email. He has a degree in economics, and was interested in learning more about Bayesian statistics. I'm sure you will be wondering how I met him, so I'll answer that. It was at a conference of the Society for Scientific Exploration, which is the professional organization I mentioned earlier, consisting of scientists interested in unexplained phenomena including parapsychology, but much broader than that. The Prince was there on his own and I was asked to sit next to him at the head table for the conference dinner. At the same conference I met Carl Sagan and Senator Claiborne Pell, for whom the Pell grants for college students are named, and who was a strong supporter of parapsychology.

Future of Statistics

AR: My goodness, you succeeded in surprising me – what a dinner that must have been! I'm not sure how to follow that, so I'll resort to another standard question that I like to ask. The theme of the 2011 U.S. Conference on Teaching Statistics (USCOTS) was "The Next BIG Thing." What do you consider to be the next big thing in statistics education?

JU: It's always dangerous to try to predict the future. If you had asked me this question at the end of the 1990s I probably would have said that online courses would be the mode by now, but that hasn't happened. One of my Davis colleagues, Alan Fenech, once wisely commented that society could progress much faster than it does if it weren't for human resistance to change. Having said all that, I'm going to predict that a few of the changes that are currently underway will gain momentum. One is the shift in focus from math-based requirements to computer-science based requirements for undergraduate degrees in statistics. (But I don't think the term "data science" will take over.) Another area where I think we'll see growth is in more intelligent automated homework and tutorials for introductory statistics. We spend a huge amount of time grading homework and exams in our large introductory classes, but students are not benefitting from feedback, which we know improves learning. More sophisticated online assessment systems could provide that.

AR: I'm especially curious to see if your first prediction comes true. Your comment about resistance to change anticipates my next question. The theme of the 2013 USCOTS was "Making Change Happen." What do you think has been the key to making change happen in your career, and what advice do you have for others who want to effect change in teaching statistics?

JU: I'm as resistant as most other people are to change, but I've noticed that there are two elements that seem to motivate people (including me!) to change. One element is that there needs

to be some clear benefit to making the change that isn't outweighed by costs. Examples of benefits to changing one's teaching style or methods include more engaged students, better assessment outcomes, better teaching evaluations and more efficient use of resources. For instance, I started using clickers in my large classes because it was clear to me that they would help students get immediate feedback and keep them more engaged during class, and the only costs to me were learning how to use the software and writing a few clicker questions for each class period. Another example from long ago is creating a web page for my courses. I did that very early in the use of the internet because I could see the efficiency of providing information that students could access anytime, without having to find me to ask. I was fortunate in both of these examples (clickers and early use of a web page) because my campus offered workshops for faculty to learn these new technologies.

The most obvious cost associated with most change is the time and energy required to make it. The magnitude of the perceived benefit has to be greater than the magnitude of the perceived cost. One way people can help effect change in statistics education is to reduce the costs to others of making the change. For instance, I applaud you and Beth Chance for creating applets we can all use! I couldn't create those myself, but I use them all the time in classes because you've made it easy to do so.

The second element that seems to motivate change is what I can best describe as an affinity for the idea represented by the change. For instance, when we were writing the College GAISE report I have to admit that I didn't think very many people would ever read it, much less actually make changes based on it. But I was wrong – it struck a chord with people, and it provided an authoritative source they could use to justify making the changes it recommended, which they wanted to make anyway. Similarly, when I first encountered applets and other interactive resources it just made sense to me that they could help students understand concepts in a way that printed materials could not, so I was excited about using them. We had lots of applets as part of CyberStats. So if someone wants to effect change in teaching statistics they need to discuss their ideas with others to see what aspects of them resonate and get people excited. Then they need to help others implement them without incurring a huge cost.

AR: Now I'll ask you to keep your promise by revealing the third secret that you mentioned at the outset. You've told us how to return homework and exams efficiently and how to avoid students arguing over a few points. Now, please enlighten us about how you discourage rude behavior in the classroom.

JU: I give them permission to engage in the behaviors that would normally be considered rude, but to do it following my rules. For instance, I acknowledge that some of them may have seen some of the material before and may be bored and want to do something else (like read something or check their email), but to please be discreet about it. I promise them that I will always end the class on time, but in return, I expect them to wait to start packing up until I'm finished. The first time they start packing up early (which they inevitably do at the beginning of the quarter) I stop talking, remind them of my request, and let them know that we're almost finished. I tell them to sit near the door if they need to leave early. Occasionally I use other tactics. For instance, I once had a cluster of students in a large class who were talking to each other fairly often – enough so that other students complained to me. And the acoustics in that

room were such that what they said could actually be heard in other parts of the room. So I sent an email to the class, saying that some students had complained about this behavior, and that I suspected that the students in question didn't know they could be overheard so clearly, and that I wanted them to be aware of it. The talking problem stopped. What's never a good idea is to embarrass a student or group of students who are acting out in some way. The other students in the class will side with the targeted students.

AR: You told me offline that you are attending the Women in Statistics Conference in Raleigh as we begin to finish this interview. What do you see as special challenges and opportunities for women in statistics? How do you think our profession is doing with regard to attracting top-notch women to pursue a career in statistics? Do you think women statisticians who specialize in statistics education face any special challenges or opportunities? (As you can tell, I'm not sure what to ask on this topic, so feel free to answer any of these questions or to ask your own and answer them.)

JU: First, I should say that the conference was amazing. In her banquet speech on the closing night, Sally Morton noted that rarely do so many people at a conference walk around looking so happy! With the exception of USCOTS, I agree that it is rare to see that. I think it was an uplifting experience for most of the attendees (which consisted of about 300 women and 2 men!) because the talks and panels focused on the positive aspects of being a woman statistician. I actually think the analogy to USCOTS is a good one (and the conference was even held in the same Embassy Suites in Raleigh/Cary!), because most people in statistics education feel some of the same sense of isolation in their home departments as many women in statistics do. To answer at least one of your questions, I think statistics is a much more welcoming attractive profession for women than most other STEM fields, perhaps because statistics is a collaborative discipline and I think women tend to prefer working with others rather than working alone.

Parting Thoughts

AR: Among all of your contributions to statistics education thus far, and I'm sure that many more are to come, can you pick one or two of which you are most proud?

JU: I'm most proud of the book *Seeing Through Statistics.* As mentioned earlier, I wrote it because I think all students should first be taught to be consumers of statistics, even if they eventually learn to be producers as well. I think that if we taught that material as the standard introductory statistics course we would attract more students to become statisticians as well, because they would understand why statistics is useful.

AR: Thanks again, very much, for the time and thoughtfulness that you have invested in this interview. My final question is: What advice do you have for JSE *readers who are just beginning their careers in statistics education?*

JU: Don't try to reinvent the wheel. When I started teaching there were no specialty journals for statistics education, there was no internet, and other than a few articles scattered around in different journals, the only resources were textbooks. Now there are so many excellent resources available that it's hard to keep up with them all. If you have new ideas for teaching and/or

research see if someone has done some of the work for you, and take advantage of all of the wonderful resources available. Also, the statistics education community is quite welcoming, so get involved and get to know people with whom you can discuss your ideas and plans. You can do this by going to conferences, participating in the AP Statistics Reading, joining the ASA Section on Statistical Education and the International Association for Statistics Education, and/or getting involved with numerous other statistics education activities.

And finally, here's a take-home exercise for readers: Try answering the more generic of the questions I've been asked in this interview. I learned a lot about myself by answering them, and I bet readers will learn about themselves too. So thanks, Allan for that opportunity!

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