

UNDERGRADUATE MATHEMATICS SEMINAR

Professor David Wagner, Union college alumnus (class of '74) and current University of Houston mathematics professor, will deliver the final seminar of the term.

DATE: **THURSDAY, May 28th**

Time & **3:45 pm** – Refreshments in the Math Common Room, **Bailey 204**

Location: **4:00 pm** – Seminar in **Bailey 207**

In this seminar, Professor Wagner will discuss:

TITLE: Symmetric Hyperbolic Equations of Motion for a Hyperelastic Material

ABSTRACT: We offer an alternate derivation for the symmetric-hyperbolic formulation of the equations of motion for a hyperelastic material with polyconvex stored energy. The derivation uses exterior calculus with weak derivatives, and makes it clear that the expanded system is equivalent, for weak solutions, to the original system. We consider motions with variable as well as constant temperature. In addition, we present equivalent Eulerian equations of motion, which are also symmetric-hyperbolic.



Math Department Picnic - RESCHEDULED

- Monday, June 1st, 4:00-6:30
- The Courtyard between Bailey and Butterfield



Calculus Help Center Tutoring Positions for Fall Are Available!

Professor Friedman is now accepting applications for Calculus Help Center tutoring positions. Tutors work in the CHC one night per week (Sunday-Thursday) from 7:30-10:00. Tutors must have had calculus through Math 115, preferably through Math 117, with grades no lower than A-. To apply for a position, send an email to friedmap@union.edu expressing your interest, listing your mathematical background (including coursework and grades), tutoring experience (if any), and statement about why you think you would be a good tutor.

Application deadline: Monday, June 1st.

Problem of the Newsletter: May 27, 2009

Unfortunately, last week's problem of the newsletter drew no correct responses. You can view a solution to the problem posted on the bulletin boards around Bailey Hall.

Here is this week's problem: Let Q be a square with side lengths one, together with its interior. Take five distinct random points in Q . Show that some two points are no more than $\frac{\sqrt{2}}{2}$ units apart.

Professor Friedman will accept solutions to this problem until 12:00 noon **Monday, June 1st**. Email your solution to him (friedmap@union.edu) or put it in his mailbox in the Math Department's office.

Where Will They Be? - My Job Search, by Andy Mackenzie '09

I'll tell you one thing. It's really hard to sleep when you're getting nagged. Here's a typical conversation I'd have with my mom over winter break: "Zzzzz." "You should look for jobs." "Zzzzz!" "You should look for jobs." "ZZZZZ!!!" "You should look for jobs." But sometimes, nagging is the wind beneath your wings – you know, the ones you received from Red Bull. Because looking for jobs at that point in time, as it turned out, was pretty essential.

Of course, I'd never searched for a real job before. Maybe not of course - that's not obvious...I probably just said that because it sounded good for the narrative. But anyhow it's true. I'd bartended and tutored and danced at clubs before for extra income, but I'd never searched for, like, a job job. So I wondered how one does it. Do you take on the role of an interesting archaeologist like Indiana Jones? Do you treat a job as an ancient artifact like Indiana Jones? Do you carry out your search wearing an awesome hat like Indiana Jones?

The answer to the first two questions, sadly, is no. Maybe that's how it worked back in the days before the internet, when dinosaurs roamed the earth and the man in the moon was just the boy in the moon, but in this modern dog eat dog world of traffic lights and Barack Obama and Starbucks, we have the internet at our disposal, ready to yield to and obey all our mighty commands.

I'll tell you one thing. What you don't want to do is wait to be found. You need to be a boy at a middle school dance right before the last slow song. It doesn't matter how much gel you put in your hair or how much cologne you bathed in or how many songs you know all the lyrics to or how great your resume and cover letter look if you're just waiting to get discovered. The right job is one that you'll want to awkwardly hold and that will want to awkwardly hold you back, even if it doesn't turn out to be the first one you thought because actually she already has a boyfriend and they've already been dating for six days (and counting!). The simple fact is even if by chance the right job doesn't receive one acceptable application and has to search for somebody, the odds that the search will begin at such a point and filter in such a fashion that you're the first compatible match aren't remotely good.

Okay, let's do this. We're all math guys. Let J be the set of jobs and let S be the set of seekers. Then let $h: J \times S \rightarrow \{0, 1\}$ be the function that associates with each pair (j, s) of a job and a seeker the value 1 if they objectively would be a good match and a value 0 if they objectively would not. There is no spectrum; a good match means that both parties are mutually happy with whatever their standards are. What's true about this function? For each j , does there exist a unique s such that $h(j, s) = 1$? For each s , does there exist a unique j such that $h(j, s) = 1$? Probably not.

But furthermore, nobody really knows what h is. For each s , there exists a function $H_s: J \rightarrow (0, 1)$ that returns s 's expected value of $h(j, s)$ – and similarly, for each j there exists an analogous H_j . It is these guess functions that we actually work with. In assuming this I'm implicitly assuming the jobs don't want someone that will work really hard and be unhappy and the seekers don't want a job where they get paid a lot but do nothing for the company because all parties are searching for sustainable relationships. Realistically, this may only be true of jobs...but I should note that simply carrying this attitude makes you an attractive candidate – if you're looking to fool everybody and weasel your way into a great place that you don't belong, somebody will probably smell it.

I'll tell you one thing. The fact is, if there's a job you expect will be a great match for you – or more clearly, if you are s and you find a j such that $H_s(j)$ exceeds whatever your threshold for interest is – then you will want to pair, and all that requires is that $H_j(s)$ exceed j 's threshold.

That process is too sloppy. Can you imagine it? All the prettiest middle school girls would dance with all the

prettiest middle school boys without knowing anything about their personalities. There would be mismatches all over the place; a really passionate Pepsi drinker could be dancing with a really passionate Coke drinker! It would just all be based on first impressions. Absolute chaos.

That's why the job market doesn't work that way. There is that first round, where you both scan each other head to toe to head and go "Yeah, you're cute..." – BUT! That's not all there is to it. And here's where I make a very important observation that while perhaps obvious is important to keep aware of – when j is approached by s, Hj(s) increases. The girl might think she only wants blonde boys, but when you come over and tell her you think she's pretty, even though you didn't attract her enough to come and approach you at first, she now sees you differently – to the point where if she'd seen you that way before, she would have come over. An office might only be actively recruiting at Harvard, but when you take your tin approach them and confidently communicate (indirectly, through your interest and active use of questions) that you believe you would be a good fit, it won't matter that you're not from Harvard. Really. There are two reasons – first, when you tell somebody that from your perspective, you think there's a good chance of something uncertain happening, they will in general find it more likely than they had originally, and a pairing being a good match is no different...and second, if you have enough interest in a job to begin the application process, the mere presence of that interest DOES make it more likely that you'd be a good match, at least from your end. A good dancer has to like his partner.

That said, all of this really relates to the interview process. This is the confidence and these are the attitudes that I personally found to be strikingly successful in separating me from the sea of applicants in an extremely desolate job market. A lot of the questions you're asked won't have right answers – they'll simply be trying to see if you squirm in a way that reveals you're just trying to trick them into hiring you. If it's a difficult technical question, don't panic in front of them and try to make it look like you can figure it out instantly; be comfortable and handle it like you would on the job – because if you look like somebody working in their office and they see that, you're golden. If you believe the objective truth is that you would be good for them, you only need to be yourself, and simply being yourself will communicate more than getting the answer ten seconds quicker or maybe even getting the answer right at all. I had a written test in one interview process where I personally found the last question both interesting and difficult, and when I realized I wasn't going to finish, I simply jotted down a brief explanation about why I was aware that what I'd already written wouldn't quite work and that I'd have to think about it some more. I got an offer.

I'll tell you one thing. I just described carrying that attitude in difficult technical interviews, but it's even more important in the interviews you might have with human resources or managers. They might ask you ridiculous things like "Describe yourself in five words." Who doesn't squirm at that? But if you squirm in a way that reveals that you believe you're not good for the company and are afraid of being discovered...well, that's what the question's designed for. If you raise your eyebrow and laugh while saying that's an interesting question, take some time, and then answer...then you answered right. If everything you say ends with a question mark like you need them to confirm that your answer is good enough instead of communicating that you are already convinced this is where you belong and are confident they'll see it...then stop it. They'll ask you, "What are your weaknesses?" Confidently tell them that you can be stubborn when you think you're right or once in a while can focus too hard on details or if you get stressed you need to go for a walk or whatever. I'm serious about communicating in everything you say and do that you're confident that it's a good match – these are real questions I've been asked and this is exactly what they are designed for.

So if you absolutely have to act like you have nothing to hide, how do you do it? Have nothing to hide. Apply to a place you believe could use you and for a position that requires skills that you genuinely have. Prepare – you won't have to hide that you did your thesis a while ago and aren't prepared to talk about it in depth if you look over it; you won't have to hide that you don't really know a lot about the company if you read about them. For one firm I interviewed with two presidents in one day and both of them asked me to talk about my thesis; I was comfortable enough with it to know what I had to say and to know that I'd need a pencil and

paper to say it, as well as to encourage them to interrupt with any questions if something wasn't making sense. The less aware you are that you're being interviewed, the less you feel examined for flaws (which you shouldn't if you come feeling like you don't have them), and the more you feel like questions are simply being asked out of genuine curiosity because you have something interesting to say, the better. That's how you're really gonna heat up that H_j(s) value.

Like I said earlier, though, it's not a one step shot. There's a great deal of uncertainty about how good the match is, especially from the employer's perspective. So they see your resume. That kills off a little bit of doubt. Then you get invited into the well-lit hallway where they check you for pimples. That kills some more doubt. Then they invite you to a second round of phone interviews. Kills more doubt. Then she shows you to her little clique of girlfriends. Kills more doubt. It's all about reducing uncertainty, and it comes at you round after round.

I'll tell you one thing. There is another piece of this process, though. What if the girl says "Alright, let's dance!" but all those times you were pretending to go to the bathroom you were courting six other girls? Well, that actually is expected at this middle school dance. You don't look confident if you only seek one job; you look overconfident and foolish – and you are. Your attitude can't be just "I'm confident we'd have fun dancing together." There's more. Your attitude has to be "I'm confident we'd have fun dancing together, and I hope I can convince you, but I realize it's possible you'll see things differently." That doesn't just sound better, it sounds rational, and unless you're applying to be a stunt biker, your job will like that you're rational. A company's worst fear isn't failing to find a dance partner, it's dancing with an absolute jerk that's going to stalk them for the rest of the year. So you tell the girl, "I understand it will take you some time to make up your mind about who you want to dance with, but in case you don't pick me, I'm going to ask some other girls to think about me too." And you do so. Of course, now you have multiple options you're interested in, so there's the chance that she can be rejected. GREAT!!!! The proper attitude for this is "Of course I have to be smart and ask a few girls just in case, but don't worry – I will definitely pick the best match." You don't make it about some scale, where she's more or less pretty than your other job – and you don't feel like you're being judged as smarter or dumber than the other applicants. It's about fit. Do you like the atmosphere, the location, the environment? Is your personal experience just right? That stuff.

Having the attitude that you are assuring the company you will go to the best fit is great because it FURTHER decreases the chance of them hiring you when you're not the right fit. I was extended a great offer from Epic in Madison, and they gave me an extremely generous amount of time to finish my job search before deciding whether or not to accept. I ended up receiving another offer from ZS Associates in New York City, and even though I knew I'd love both jobs and they were both great offers, ZS Associates was simply a better fit because of proximity to my family. Why did Epic give me so much time? Because they didn't simply want ME; they wanted me if they were going to be the best fit for me. All this crazy confidence-fit-attitude stuff I'm spewing all over this newsletter is based on real experience in the field, I swear. I'm doing my best to give you actual experiences I have to demonstrate that I'm not just regurgitating career advice off a pamphlet; these attitudes have been relevant in these particular situations and you can see in these particular instances why they bring success.

Anyway, I said that the possibility of the girl getting rejected is great...but why is that so great? Because now, if the girl's both convinced you're the dancer of her dreams and aware that she's not the only thing you're considering, she'll try to convince YOU that it's a good fit. Which is the best part. If it comes to the point of an offer, it'll be a ten-minute speech going through the benefits packages and the bonuses and the salary and the vacation days and everything. On the other hand, if a job wants to hire you but knows you're looking nowhere else and hence have no backup plan...well, think about it. It's just that simply doesn't happen because it's common knowledge in the job market culture that every job applicant is looking around, and especially right now you disadvantage yourself tremendously if you don't do so. The thing is, if after the girl puts on all her makeup to dazzle you and pulls out all the stops, you still don't think it's the best fit...she's going to agree with you. There's just not any uncertainty left at that point about the objective truth,

and fortunately the job market world diverges from the middle school metaphor here because there are no hard feelings about it.

Anyway, enough about the process with one firm, right? It's extremely important because even initiating the process is extraordinarily difficult right now. It would be a grave mistake to underestimate just how scarce good jobs are right now, which is why I've put the energy into emphasizing the importance of taking each process very seriously and putting in the effort. But the fact is the hardest screening round right now is the first. It's expensive for a company to fly you to their headquarters or put you in a hotel or provide meals for you or have their employees talking to you and interviewing you while on the clock. Getting them to commit that much interest you, and go through the process I just described, is the biggest challenge – especially right now.

I'll tell you one thing. This is where the nagging came in. If you're searching for a needle in the haystack, sometimes you have to just put a metal wall behind it and blast it with a jet of high-pressure air until you hear a clink, then frantically look toward the sound. That is my advice. Don't wait for anything to be put in front of you, by the career center or a family friend or anybody. Get out there. You have an internet. Use it. It's like a jet of high-pressure air.

What you do is you sign up for Monster or CareerBuilder or both. They have search engines built in. So you put in words like math. Or analyst. Or actuary. Or programming – I should also stress that any level of programming background is unbelievably marketable for a math major right now; taking even once course very realistically could be the difference between getting a job or not. Anyway, there will be a million and a half job postings. Some only require that you submit a resume or cover letter. Have those. Make them as nice as you possibly can (although, that said, the only thing I'd really change on my cover letter from application to application was the date and the name of the position I was applying for). You'll bang it out in a minute. Other ones require you sign up for the company site, which takes up time and is annoying – the idea, I think, is that you'll only put in the time if you're seriously interested...and that's exactly what I did with those ones. Anyhow, do like twenty of those a day for a week. Or for two weeks. It takes so little time; it's effortless. I must have sent out over a hundred job applications with what I considered a strong resume, and that lead to the initiation of three interview processes and eventually two offers. You really have to take the shotgun approach to this job market – the odds of a single firm even responding to you to tell you that they're sorry but they don't think your experience matches their needs, let alone the odds of them actually being interested, are bad. So to increase your odds, you have to apply to a whole collective noun of them.

I'll tell you one thing. One last important thing to consider is job security. I have a close friend who was shown an offer but never quite given it because a manager with hiring authority had to approve it...only to have the offer rescinded several weeks later after halting his search. Health care is what I'd recommend considering; both of my offers came from firms that dealt in or had clients who dealt in health care in one way or another. Be especially cautious about anything related to finance.

Anyway, the girl I personally will be sharing the slow dance with next year is ZS Associates. I'll be working in their office in Manhattan as an Operations Research Analyst. Essentially, ZS Associates is a consulting firm whose clients are primarily (though not exclusively) pharmaceutical companies. These companies make drugs. In order to make money, these companies must sell drugs. But drugs require prescriptions. Therefore, in order to make money, these companies must have doctors prescribing them over the competing drugs. In order to accomplish this, they send sales agents to doctors – family medical centers, hospitals, witch doctor huts, you name it. But some doctors just haven't heard of the drug and would love to prescribe their faces off, others already are prescribing it, others are really wary of that nasty chance of paralysis side effect and would need some really sustained effort, and others have had so many sales agents sent their way that they're beginning to get annoyed. Therefore there's a bit of a question about how to allocate these sales men optimally..., which is a math problem, which is a nice fit for me since I majored in the math.