

## Course Introduction



**Godfrey Harold Hardy:** *The mathematician's patterns, like the painter's or the poet's, must be beautiful; the ideas, like the colours or the words must fit together in a harmonious way. Beauty is the first test: there is no permanent place in this world for ugly mathematics. [A Mathematician's Apology, 1940]*



**Alvin M White:** *[Humanists] consider mathematics to be one of the humanities; who understand mathematics to have much in common with literature, philosophy, art, music, and criticism. [The Process of Education, 1994]*

# Course

Interface of mathematics with society, science, and everyday life, such as:

- Mathematics and religion
- Culture and ethics of research mathematics and mathematicians
- What is mathematics and where did it come from?

The course will be based on class discussions of homework readings, short reflections, and a bit of research. You will also pursue a semester long project oriented toward your own personal interests in mathematics.

# Success in Mathematics

💡 Imagine a classroom of high school students and ask them to sketch a mathematician at work.

💡 Sketch what you think might be a common response and share your sketch with a neighbor.

## Carl Friedrich Gauss



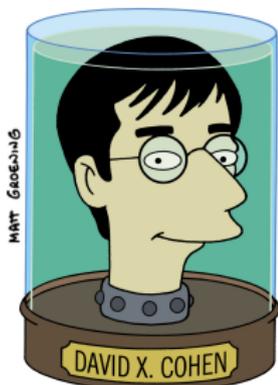
**Carl Friedrich Gauss:** *Finally, two days ago, I succeeded - not on account of my hard efforts, but by the grace of the Lord. Like a sudden flash of lightning, the riddle was solved. I am unable to say what was the conducting thread that connected what I previously knew with what made my success possible. [Eves' Mathematical Circles Squared]*

## David Blackwell



**David Blackwell:** *Basically, I'm not interested in doing research and I never have been. I'm interested in understanding, which is quite a different thing. [Albers & Alexanderson, 1985]*

## David X. Cohen



*I have a bad memory. That puts me at somewhat of a disadvantage. So this is how my mind works for math and maybe for everything in life. Often I can remember the process of doing something but I cannot remember if you ask me specific numbers - I would never remember that. And studying for tests and things, I found that just writing stuff over and over again would put it in my brain somehow. Not reading it 10 times, but writing it. So there is something going through the writing center of my brain. [Personal Interview, 2005]*

## Mary Ellen Rudin



**Mary Ellen Rudin:** *I have never minded doing mathematics lying on the sofa in the middle of the living room with the children climbing all over me. I feel more comfortable and confident when I'm in the middle of things, and to do mathematics you have to feel comfortable and confident. [Albers and Reid, CMJ, 1988]*

## Jeff Weeks



**Jeff Weeks:** *Everything I do I see as pictures. For me, the mental images are totally convincing. Once I can see in my mind how something works, then writing out a proof is simply a matter of recording what I see.* [Personal Interview, 2006]

## Andrew Wiles



**Andrew Wiles:** *Perhaps I could best describe my experience of doing mathematics in terms of entering a dark mansion. One goes into the first room, and it's dark, completely dark. One stumbles around bumping into the furniture, and gradually, you learn where each piece of furniture is, and finally, after six months or so, you find the light switch. You turn it on, and suddenly, it's all illuminated. You can see exactly where you were. Then you move into the next room and spend another six months in the dark. So each of these breakthroughs, while sometimes they're momentary, sometimes over a period of a day or two, they are the culmination of and couldn't exist without the many months of stumbling around in the dark that proceed them. [Nova's *The Proof*, 1997]*

## Your Success in Mathematics

- How does your mathematical mind work? Do you have a photographic memory? Are you really good with numbers? Are you good at visualization?
- Do you prefer to collaborate or instead mostly work by yourself?
- How would you describe the process of doing mathematics to someone else?
- How do you get the flashes of insight that you need to do math?

## Stereotype Vulnerability

- White men performed worse on a test of mathematical abilities when reminded of Asian-Americans' superior performance in mathematics (Aronson, 1999).
- Asian women performed better on a mathematics test when 'cued' as Asians, but they performed worse when their gender identity was 'cued' (Shih, 1999).

💡 Discuss whether you or someone you know have ever experienced something similar to stereotype vulnerability as part of some kind of group (for example, gender, race, "good" or "bad" student, older sibling, hair color, athlete, southern accent...) where external expectations from someone else (teacher, society, parents, friends...) affected your performance.

## Math Gene

- *I was in Japan interviewing women scientists and engineers. I started out with an assumption about the role of math in keeping women out of engineering careers, because we know that girls are discouraged in the U.S. where too often math is considered not only gendered male but innate in a funny way. . . . When I referred to the math problem in Japan, nobody could figure out what I was talking about. . . . Nobody could fathom the idea that if learning higher math didn't come easily, you weren't supposed to continue. You were supposed to work harder. It became clear that Japanese women had very different career opportunities than men, but it had nothing to do with some concept of a math gene. [Lazarus, 2001]*