Border Walls, Assault Rifles, and Data Science

William Yslas Vélez

Border walls are a means of separating "ourselves" from "them." Sometimes border walls are built of metal, cement, or rock. At times border walls are a natural barrier—a desert or river—but sometimes they are more subtle, a mode of dress or speech. Border walls are supposed to function as barriers, but often they are symbolic. (See bit.ly/2DsQsdg for Francis Su's discussion of symbolic borders.) Insiders think these walls protect them from outsiders. But given any physical structure, creativity and persistence will find a way over, under, through or around.

At my retirement party in September 2017, mi primo hermano (in the Mexican community first cousins signify a closer relationship as the literal translation, cousin-brother indicates), Carlos Vélez-Ibañez, Regents Professor of Anthropology at Arizona State University, gave me a copy of his latest book (*The US–Mexico Transborder Region, Cultural Dynamics and Historical Interactions*, edited by: Carlos Vélez-Ibañez and Josiah Heyman, The University of Arizona Press). On page 65, I came to the section: *Border Walls: States of Exception and Necropower*. It was an eye-opener:

> "For example, Spanish border agents at Melilla do not officially register migrants apprehended at its border fence, as is required by Spanish law. Instead, they often turn migrants over to Moroccan authorities, who then leave them in the desert to perish." [page 67]
>
> "…the United States constructed the border fence along sections of its border with Mexico that is a combination of walls and barriers, sometimes including concertina wire and CBP (Customs and

Border Protection) agents armed with M-16 assault rifles." [page 67]

On March 22, 2018, the following appeared on the front page of the Arizona Daily Star: "Agent in border killing acted as 'executioner,' US argues."

A sudden realization came to me; the border wall is not the issue; it is how that border wall is guarded. The guards posted along border walls can be given necropower—power over life and death.

Mathematical Border Guards

As a mathematician reading these passages, an image immediately came to mind. College algebra and precalculus are walls that students need to surmount if they are to proceed onto STEM fields in college. In my mind, I pictured pre-college teachers shooting at these students as they tried to surmount this wall. On the other side of that wall were the college teachers also shooting down those students.

A wall forces an individual to expend limited resources or getting into debt on attempts to get across that wall.

Is that image relevant? From my early years in college I recall the following directive aimed at a large class of students in a science or engineering class-"Look to your left, look to your right. Only one of you will be here at the end of the semester." That is someone displaying necropower, the power to destroy a student's hope of a STEM career! Academia has built walls that must be surmounted, and we, as mathematics teachers, are the border guards.

Let's review the impact of border walls.

A wall expresses superiority.

We made it over that wall. In fact, it wasn't even a wall for many of us mathematicians, so many of us cannot begin to understand how it is possible that others cannot get over that wall. We learned this material, passed the exams; why can't others? And if they cannot, then they do not belong on our side of the wall. We have standards; moreover we have tenure, the academic equivalent to having an assault rifle. Some see it as their duty to maintain the culture of mathematics as one of precision and rigor. Tenure allows us to guard those walls with fierce determination.

Gated communities

Look at the ten best research mathematics departments in the USA. You will notice that underrepresented minorities are not part of that faculty, and there are few women among that group. These departments have been very effective in maintaining this wall to keep these two populations out. When one looks further, one also sees that underrepresented minorities are almost invisible among the graduate and undergraduate students in these departments. The reality is that graduate students at these top mathematics departments are the potential faculty at the top ten schools. This particular border wall has proven to be effective in keeping out under-represented minorities. For more thoughts on this, see bit.ly/2QsApi8.

A wall forces an individual to expend limited resources or getting into debt on attempts to get across that wall.

Students who complete high school without sound mathematical preparation must take remedial courses. This takes away from the ability to complete a STEM degree in four years and it often forces students into debt. Since resources are limited, a non-STEM degree is more financially viable.

A wall forces an individual to find a way around, a way that can lead to danger, and to death.

Many students, in particular underrepresented minority students, have to begin their college studies at community colleges. Without a plan to pursue a STEM degree, students avoid mathematics courses until later, and then, after three years, realize that they have used up much of their financial aid; therefore transferring to a four-year university is not possible. We have lost those students.

We Are Not Border Guards

We should not view ourselves as border guards—rather the gift that we have for doing mathematics is one that should be shared with our students. Our mathematics courses are vital for tomorrow's jobs and we should view our instruction in mathematics as one that motivates students to the continued study of mathematics. Mathematics should be the pump into STEM careers, and not the stopper (Mathematics Instruction, An Enthusiastic Activity, William Yslas Vélez, On Teaching and Learning Mathematics, AMS Blogs, August 1, 2014).

A wall forces an individual to find a way around, a way that can lead to danger, and to death.

Border walls can be changed, or we can devise a way around them that can lead to STEM fields. In fact, a different view of these walls would make them more palatable. College algebra and precalculus should be viewed as the bridge to the future and we, in the mathematical community, should stand on both sides of that bridge, encouraging students to succeed.

Currently there is an opportunity that presents itself to mathematics departments: data science. This new endeavor is coming to our four-year institutions. How will mathematics

departments deal with this subject? Already we hear comments from mathematicians that express disdain for the lack of mathematics needed for this topic. We have heard these same comments before aimed at applied mathematics, statistics, and computer science—all areas which greatly benefitted from the expertise of mathematicians and are now vital to scientific endeavors.

I hope that mathematics departments will use this opportunity to aggressively join in the development of data science. Courses in this subject can show students how useful and necessary mathematical ideas can be (see, for instance, bit.ly/2HIjbtK). Entry-level courses in data science can be viewed as a bridge to STEM careers, and perhaps even to the further of study of mathematics. I would like to see mathematics departments enthusiastically join in the efforts to develop data science programs and welcome students into our realm of quantitative thinking. ■

The views in this article do not necessarily represent the views of the MAA.

William Yslas Vélez is a retired professor of mathematics at the University of Arizona.

Mathematical Sciences Semesters in Guanajuato, Mexico

William Yslas Vélez

For some years I have thought that a semester-long program in mathematics in Latin America, like the Budapest Semesters in Math or the Math in Moscow program, would be a valuable asset to students around the world. In particular, a program like this in Mexico would be attractive to Hispanic students in the U.S, an opportunity for intense study of mathematics combined with an immersion in the Mexican culture.

A number of years ago, CIMAT (Centro de Investigación en Matemáticas) in Guanajuato, Mexico, sent a delegation of mathematicians to the mathematics department at The University of Arizona (UA) to discuss possible collaborations. The UA responded by sending a team of ten mathematics faculty to CIMAT to continue these conversations and I took the opportunity to propose that CIMAT establish semester-long mathematical programs, whose courses would be taught in English. I am pleased to announce that these programs will begin in August, 2019. Here is the website for details, list of courses, and application procedures: mathsciencesgto.cimat.mx/es. The fall semester will explore mathematical tools for modeling, the spring semester will study mathematical tools for data science and the summer program will be partial differential equations.

An attractive feature of this program is that the prerequisites are third semester calculus and linear algebra to allow college students to add an international component to their undergraduate education early in their mathematical career. Moreover, tuition, travel and living expenses are within reach of students who could not have previously studied abroad.

CIMAT is an accredited institution of higher education, so credit earned there will transfer to the student's home university. The University of Arizona is currently working to establish an agreement with CIMAT where credit would be granted by the University of Arizona.

An added attraction is that CIMAT is located in the beautiful city of Guanajuato, a city full of history and beauty. Students will appreciate living in such a historic city, with its many cultural activities.