Theorem 1: Muses

Besides pure math, I also study philosophy and art. To most, the trifecta – especially the combination of math and art – is an unusual one, and when I tell strangers, their response is usually some variation on "why?". Many people believe that I can't enjoy both simultaneously; some even assume I study pure math for the money. Perhaps the confusion is because almost everyone thinks of themselves as an artist in some way, but only a few think of themselves as mathematicians. Art is close, familiar, but math exists at a distance.

Figure 1: Image 8 of *3,33 MIN*.

Yet I've noticed that the link between the two is frequently more apparent for those who've dedicated their life to either field. In Greek mythology, the muses, springs of divine artistic inspiration, were also the source of mathematical discovery. Mid-20th century surrealists such as Escher, Magritte, and Dali drew from math – often very technical math – for their work. For me, my passion for math and for art are irretrievably intertwined. In a sense, they are the same thing. Thus, in that spirit, I'd like to tell you why I love math, in the language of my love for art.

Lemma 1: Process

One reason I shoot on film is the intricacy of the process. I do each step by hand: manually focusing, winding the film, performing the chemistry. This immediacy is so valuable to me because it necessitates iteration. The time I spend on each step forces me to think carefully about my artistic choices. My train photographs are the final versions of a dozen prints of the same exposure: the glint of the tracks, the detail in sunlight sections, the silhouetting of the passengers, etc. are all products of careful repetition.

The process of studying math is similar: as lovely as it would be to look at a problem and solve it instantly, that's not how it happens. This isn't a bad thing: in fact, it's exactly why I enjoy math research. One of my mentors, Sándor Kovács, is married to an artist. Whenever anyone calls them "opposites", they're quick to refute the idea, saying that they work in very similar ways. In fact, they teach courses together at UW on the creative process. To me, this is a very natural idea: iteration and collaboration define both artistic creation and mathematical research.

Lemma 2: Rules

The popular perception of math is that it's defined by rules and patterns, but the truth is that we create and break rules as often as we obey them. Symmetry is charming, but simultaneously, the unexpected violation of symmetry is also beautiful. I remember, as a high school student just be-

ginning to learn about group theory, reading the proof that S_n has no outer automorphisms except for, bizzarely, a single one for $n = 6$. I've revisited the proof again and again, but understanding the calculations does not lessen the feeling of cosmic coincidence; for this reason, it remains one of my favorite results.

Similarly, photography has its rules: the Rule of Thirds, the Rule of Odds, the Rule of Space. Yet, just as in math, the greatest photos break these rules. In the 1930s, many Japanese-American families were separated by immigration laws. As a result, family photographers drew on the practice of double printing - cutting and combining film to unite separated families. They broke the fundamental rule of photography, asserting reality instead of simply capturing it. Using double-printing, I created an image where both shadows are me. It's part of a series on my Hindi name, Roshan; the two selves represent the duplicity of an existence where even my name changes with the context. The result is an impossible image which has been a favorite of the artists who have seen my work.

Figure 2: Image 7 of *Shining Lights*.

Lemma 3: The Aesthetics of Communication

As enjoyable as the rest is, however, the most important connection between math, art, and philosophy for me is the central aesthetic role of communication. In art and philosophy, this is clear: arguments are beautiful for their clarity, and paintings and photographs are beautiful for their expressiveness. However, we mathematicians often forget that the true marker of a beautiful proof is the same: the way that it unlocks a complex subject for the reader, often through a clever change in perspective.

Finding these shifts is exciting, but sharing them is just as important: art is not meant to be admired alone. I've spent years tutoring, speaking to younger students and teachers, mentoring incarcerated people, and creating learning materials both written and visual. I've built a peer tutoring network where nearly 500 students help each other with advanced math classes for which Stanford offers no support, and a corresponding wiki containing tutorials and my and friends' notes from dozens of classes. Sharing that moment of understanding, where something too complex to understand becomes crystal clear, is what motivates art – but it is also what motivates math.