Addressing autism. Harvard Medical School will lead a University research program on the biological causes of autism-related disorders. The work is funded by a $20 million gift from K. Lisa Yang and Hock E. Tan, M.B.A. ’79, CEO of Broadcom; the initiative will be named in their honor. Pusey professor of neurobiology Michael E. Greenberg, chair of the department of neurobiology, will be the inaugural faculty leader. The Harvard program expects to collaborate with a similar center, funded by the same donors, at the McGovern Institute for Brain Research at MIT (Tan’s undergraduate alma mater).

Honor roll II. Higgins professor of molecular and cellular biology Catherine Dulac (see “The Mr. Mom Switch,” May-June 2015, page 11) and Pusey professor of neurobiology Michael E. Greenberg—chair of the department of neurology, and inaugural faculty leader of the new autism program—were jointly awarded the Society for Neuroscience’s Ralph W. Gerard Prize for lifetime achievement in neuroscience. Eni, the Italian oil and gas company, has conferred its Energy Frontiers award, for research on renewable energy sources and storage, on Sykes professor of materials and energy technologies Michael J. Aziz and Cabot professor of chemistry and professor of materials science Roy G. Gordon for work on an innovative battery technology.

Landscape laurels. The Cultural Landscape Foundation has established a biennial $100,000 prize in landscape architecture, named in honor of Cornelia Hahn Oberlander, B.L.A. ’47—a graduate from the Design School’s second cohort of women. It will be conferred beginning in 2021, the centennial of her birth.

Award on Friedman University Professor Charles M. Lieber and Armand Paul Alivisatos, executive vice chancellor and provost of the University of California, Berkeley, for their pioneering work in nanoscience and nanomaterials. They shared a $500,000 honorarium. Some of Lieber’s work, with important biomedical applications, was reported previously at harvardmag.com/lieber-17.

One of the more frustrating things about learning math is that professors insist it is beautiful. Imagine not just asking toddlers to eat their vegetables, but demanding they appreciate the subtle interplay between asparagus and a balsamic glaze, and you will have some sense of how I felt when I enrolled in my first college math course. After a long night of writing proofs, fueled by off-brand cereal and stale coffee, beauty was too high a concept for me. I came to see aesthetics as a kind of bragging. Saying math is beautiful is like riding a bike with no hands—it implies total mastery. I found it very annoying.

Just before Thanksgiving my freshman year, a friend and I were struggling to prove an abstract theorem about convergence—the way patterns of numbers fall together at infinity. We were frustrated, tired, and the Doritos stocks were running low. I felt like we were fiddling with tiny loops of yarn in a knitted tapestry, working endlessly on fine motions of logic. Suddenly, we both stepped back from the blackboard in astonishment. In the scribbles of chalk appeared a deep connection, fusing completely different ways of thinking about convergence into a united picture.

The novelist Marilynne Robinson sees beauty as intimately related to a sense of wholeness, a way of holding a complex system in the palm of the hand without crushing it into something simpler. To a pair of young math students, the proof was staggeringly beautiful, connected and branching like a tree. Math, I’ve realized, is like wandering through an art museum flooded with maple syrup. It takes all my strength to trudge from painting to painting, hours of hard work behind every proof. After all that effort, after I’ve slogged to the next piece of art, I usually don’t feel anything beyond a vague appreciation. But, just as I’m about to give up, I see something that kicks me in the stomach. I don’t know where those moments of beauty come from, what snaps and lets unrelated ideas suddenly fall together into something transcendent. The mathematician Alexander Grothendieck said that the perfect proof is like a nut submerged underwater—after weeks and months of letting the shell soften, suddenly it peels open as naturally as a flower. Something that extraordinary must be shouted from the rooftops.

The most beautiful thing about beauty is its resistance to capture, its fluidness. Beauty can’t be owned, not even linguistically, which is why great art leaves us breathless. "Human speech is like a cracked kettle on which we beat out tunes for bears to dance to, when we long to move the stars to pity," writes Gustave Flaubert. With description gone, the only response to beauty that remains is duplication. Beauty demands to be shared, copied, and imitated—so social media fills with photos of sunsets, Monet paints multiple haystacks, and mathematicians organize conferences.

After soaking in the moment of convergence that November night, my friend and
I excitedly texted our group chat and told them to come see for themselves. “Mathematics is in some ways most real when communicated from one person to another,” says Cabot professor of mathematics Curtis McMullen, chair of the department.

A professor once told me that humanists and mathematicians are the only people left in the academy who are driven primarily by beauty. For an ambitious university like Harvard, ideas and actions have come to be valued in material terms: money made, lives saved, patents filed. But culture and pure math are not useful in ways that can be measured. No one can show that art saves lives. When mathematicians write abstract proofs, they don’t make an obvious advance in algorithms or circuit boards. Everyone may be drawn to beauty, but in an age of cost-benefit analyses it has taken on an aura of unseriousness.

“It’s really hard to argue for beauty. That might actually be an inherent quality of beauty,” my friend Daniel Frim told me one night in the dining hall. “It’s really easy to argue for utility, and I think that is an inherent quality of utility.”

During sophomore fall, with the concentration decision deadline looming, I found it impossible to escape the logic of usefulness. The previous summer, I’d worked on something a bit interesting: smog. Simplicity, beauty, and utility are often at odds. As the months unspooled, I tried to break down how weather and pollution interact, and how that might shift with climate change. I liked the work, and felt like a useful part of the fight against our current environmental crisis. At the same time, I was drifting away from those moments in the math department chasing rare glimpses of the transcendent, or those times poring over books in Widener searching for wisdom. Smog, simply put, is an ugly thing to think about. As I tried, as I saw it, to decide between a life dedicated to beauty or to usefulness, I could not help but ask: How could I choose the path that saves fewer lives? The pursuit of beautiful things seemed not just impractical, but wrong.

I'm not the only one stuck in this mode of thinking. Undergraduates today have been raised on quantification: on standardized test scores and the shadow of a financial crisis. Applied math concentrators at Harvard have tripled since 2008. English has shrunk by almost 50 percent while statistics has grown tenfold. Many of those students are pursuing investment banking and high-powered tech jobs, which require increasingly sophisticated math skills. But this shift is about more than money. On the scale of Wall Street, money becomes more a yardstick for success than a material necessity.

In our age of self-optimization, even literary education is justified by usefulness, either in terms of psychology (books give a small but statistically significant boost to emotional intelligence) or in terms of professional development (as if reading Virginia Woolf is meant to improve our emails). Goodreads accounts and online scholarship aggregators make and online scholarship aggregators make reading and criticism into a game of making numbers tick ever higher. I don't think it's bad to do things because they make a measurable impact on the world, but we lose something precious if only measurable things are done.

As the concentration deadline drew closer, I started to feel as if my decision had been made for me. Although on some level I believed that beauty matters for its own sake, when I asked pure mathematics to make its case, it remained silent. So I did the rational thing and concentrated in physics, jumping headlong into research on the atmosphere.

My math friends and I still gather on some Saturdays in the Science Center, in empty classrooms a short walk from the math department coffee machines, and try to pull beauty out of a pile of preprints. But we've mostly scattered to labs across campus, spending our days fiddling with data and clunky algorithms, dispassionately taking problems apart, considering the pieces, and putting them together again. Applied science can be quite beautiful, revealing the hidden complexity in something as simple as wrinkled clothes, but for me and my friends, it is about finding solutions, answering questions practically and ugly as duct tape on a broken car bumper. So at those rare times when we can get together and think through a surprising and entirely inconsequential paper, appreciating the ways a beautiful proof shows that what we thought was separate has always been together, I am reminded of why I started doing mathematics in the first place.

Because science is slow going, I have spent most of my college years finishing the project on Beijing smog. As the months unspooled, I tried tool after tool to decipher the data, doing my best to break down the strange behavior of polluted air. Late one night in the Leverett dining hall, as I scrambled to get a report ready for my adviser, I made a graph that clarified everything: I could predict smog just by looking at wind and humidity. A bit of clever statistics—discovered after long nights of trial-and-error—could describe...
the behavior of this bit of air better than a supercomputer model. The insight was, in a word, beautiful.

The cliché that beauty is in the eye of the beholder is, like most clichés, completely true. Beauty is not a property that something has, but is more a way of seeing, an orientation. During that night when I first realized math could be beautiful, convergence didn’t change: I did. This, I think, is the saving grace for the applied sciences. Environmental degradation is very ugly, but it can be studied in a way that yields beautiful insights into how systems work and fail, and those discoveries have the side effect of helping people.

As I worked on the smog project, I began to realize that, at least for me, beauty is not an option, but a necessity. Before I could study the effects of climate change, or come up with a clever new policy, I had to understand the interlocking systems at play in the environment. And before I could understand the complex dynamics of the world, I had to stare long enough to see the entire picture. Because beauty is intimately related to a sense of wholeness, to see something all at once is to see it as beautiful.

Strangely, in my quest to be useful, to optimize, I’ve had to slow down and look again for beauty. I’ve found that the danger of busyness, besides burning out, is that beauty is awfully hard to schedule. By the end of each semester, the space I’ve tried to leave for beauty—the creative-writing classes, the deliberate thinking through research problems, the math puzzles with friends—gets compressed as piled-up problem sets and meetings take more and more of my energy. Beautiful things take their own time. Mathematics is stunning only if it is allowed space, if problems can go days on end without a solution. Otherwise it is a chore. I cannot even read if my mind is too heavy with things to do; focus scatters like startled birds.

I have trouble believing in something called human nature. But if there is a universal, I think it is the desire to be like other people, to take in what we admire about our friends and family and make it a part of ourselves. I worry about this, because numbers are much easier to copy than subtle things like a sense of curiosity or compassion. And we are absolutely flooded in numbers. Most great scientists have lots of papers and citations, CVs that stretch for pages. I know I fixate on the long lists of metrics that appear next to the names of people I admire on Google Scholar, and I get the urge to speed up my work to match.

The solution to the flood of numbers and metrics, I think, is to take beauty seriously—not to treat it as ornamentation to be added on top of some base level of measurable achievement. I worry that if I don’t focus on deep understanding, I’ll end up attempting to produce flashy papers and stylish achievements as quality falls away. It’s the scholarly equivalent of teaching to the test, of numbers polluting the way we learn.

After months of guiding the Beijing smog research through revisions and peer review, we finally published earlier this year. I’ve moved on to a new project, studying how deforestation has changed the monsoon rains in India. It’s another ugly problem, a small example of how we are unintentionally reshaping Earth for the worse. But there is also the opportunity for understanding a complex system, appreciating its beauty, and maybe even restoration.

Berta Greenwald Ledecky Undergraduate Fellow
Drew Pendergrass ’20, a physics and mathematics concentrator living in Pforzheimer House, has stopped to smell the roses.

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**SPORTS**

**Failure to Finish**

Dreadful defeats—and a heartbreaking Game—produced the Crimson’s first losing season of the century.

**At approximately 4:05 p.m. on November 2, the 2019 Harvard football season began unraveling.** Until that moment, the campaign was proceeding in the style to which coach Tim Murphy’s teams had been accustomed for two decades. With six seconds remaining in the game at Harvard Stadium, the Crimson led Dartmouth 6-3. If Harvard could knock down a long Big Green pass into the end zone, its record would move to 5-2 overall and 3-1 in the Ivy League, positioning the team for an Ivy title run.

But even though two Harvard defenders got their hands on the Hail Mary throw...

Four score: With Yale’s Melvin Rouse II in vain pursuit, Harvard’s Aidan Borguet heads for the goal line. Against the Elis, the Crimson freshman back rushed for a series single-game record 269 yards and amassed four touchdowns on only 11 carries, a performance that helped earn him the Ivy League Rookie of the Year award.