# THE $E_8$ NEWS STORY

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The American Institute of Mathematics (AIM) recently had the experience of promoting a math result in the media. We had hopes of reaching beyond the usual avenues that specifically cover math stories (such as MAA and AMS) to more mainstream science and technology media, such as Science, American Scientist, and the weekly Science supplement of the New York Times. We also wanted some local coverage: AIM is in the process of moving from Palo Alto to Morgan Hill, California, and we would like people in our local community to know about AIM and its activities in research mathematics.

Our story on the representation theory of the exceptional Lie group $E_8$ grew far beyond our expectations. We were hoping for coverage in science and technology magazines, but in the final days a transition occurred and the story was picked up by the popular media. The $E_8$ story was covered in hundreds of newspapers, dozens of radio stations, and on local TV; it even made national news on NPR's *All Things Considered* and ABC's *Good Morning America*. Representative Jerry McNerney (D-Calif) delivered a statement to Congress about the $E_8$ result.

The $E_8$ story concerned part of a larger project called the "Atlas of Lie Groups and Representations." The project, led by Jeffrey Adams from the University of Maryland, has a goal of explicitly computing all the irreducible unitary representations of the real reductive Lie groups. Once computed, these data and some tools to make them more useful will be made available on the Web in a user-friendly format. This will be valuable to researchers in several areas of mathematics and the sciences. Handling $E_8$, the largest of the exceptional Lie groups, is one of the more difficult aspects of the project. The $E_8$ story concerned a big step in computing the irreducible unitary representations of $E_8$. The Atlas team has 18 members, a half-dozen of whom were directly involved with the $E_8$ calculation.

Exactly why the $E_8$ story made the news is still a bit of mystery. We don't have a magic recipe for turning a theorem into a news story, and it is not clear that similar efforts in the future would lead to similar media attention. In this article simply we describe our experiences during the lead-up to the $E_8$ story and the few days it was in the news.

The press release and links to various stories are available on the $E_8$ website: `aimath.org/E8/`.

## 1. The decision to promote the $E_8$ story

On January 8, 2007, Brian Conrey, Director of AIM, received a long email from Jeffrey Adams. Most of the email was an account by David Vogan, member of the Atlas team from MIT, of the final steps in calculating the Kazhdan-Lusztig-Vogan polynomials for the split real form of $E_8$. It was clear that they had made a major advance towards their goal, and they were extremely excited about the result. Vogan's entertaining account described a long sequence of alternately fortunate and unfortunate events that led up to the final result. The people at AIM were immediately caught up in the excitement and decided that this was a story that deserved to be told.

AIM planned, at some time in the future, to promote mathematics news stories as part of its outreach efforts. We weren't really prepared for the $E_8$ result, but we couldn't resist the temptation because the $E_8$ story seemed to be a perfect fit for AIM. It had the necessary ingredient of being an important result in a difficult area of mathematics. But more importantly, the initial phases of the work were sponsored by AIM, and then continued with support from AIM and the NSF. And finally, the result arose from a large collaboration, which fit perfectly with AIM's founding principle of bringing a more collaborative approach to research mathematics.

The first step was persuading the Atlas team that turning $E_8$ into a news story was a possibility. It was critical that Adams and the other Atlas people commit to taking an active role in the preparations. Naturally, they were skeptical. Perhaps the biggest stumbling block was the apparent impossibility of making their mathematical results comprehensible to the public. The argument was: this is difficult to understand; why don't you wait for a story about the prime numbers or something else that you can explain to people? And how will you answer questions like "What is this good for?" Conrey brushed those concerns aside: "it will take some time, but with enough effort we will figure out how to convey a sense of the result and why it is interesting." And Conrey cited a cultural obligation: mathematicians need to do a better job promoting mathematics, and we owe it to mathematical community to seize this opportunity.

After some internal deliberations, Adams and the Atlas team were on board. The main people in charge of preparing for the news release were Brian Conrey and David Farmer from AIM, and Jeffrey Adams and David Vogan from the Atlas team. Most universities have a public relations office with experience handling news releases, while AIM has a small staff and little knowledge in these matters. So we hired Shari Boxer Baker from JDS Group PR, a public relations firm, to assist in the preparations. Having put together a group of people, and still caught up in the excitement of the result, it was starting to dawn on us that there was a lot of work to do.

## 2. Preparations for the news release

It was the middle of January and time to start work. The first question: when should we have the news release? One idea was to get it out as soon as possible. But there were also arguments that the release should be associated with an "event." After some initial difficulties in writing a news release that anyone would want to read, we realized that getting the story out quickly was impossible. We set March 19 as our target date. The Atlas team would be meeting in Boston, and Vogan was scheduled to give a colloquium at MIT. This would be the "official announcement" of the $E_8$ result. That gave us about 8 weeks to prepare.

Things got off to a rough start. We had no consensus on the strategy for releasing the story, and the mathematicians on the team had underestimated the effort needed to turn the new result into a story the general public would find interesting. Boxer Baker had experience with news releases, but she was not familiar with the culture of mathematics. While some of her ideas made sense to us, others seemed totally incompatible with the way mathematicians think.

One thing was clear: early in the process we needed to begin drumming up interest in the story. We contacted journalists and science writers whom we knew personally and told them of the interesting story about $E_8$ which would be coming out in a few weeks. Contacts

included science writers who had previously written about AIM, people at MAA and AMS, and journalists at newspapers near AIM and near MIT.

When we contacted those people, we had to tell them something about the story. In some cases (for those people we viewed as having a high level of interest in mathematics) we just forwarded Vogan's email with a short note at the top. Much to our surprise, Vogan's account, which we found exciting and fascinating, did not have the same effect on the people we hoped to write an article on $E_8$. The problem was that it is not immediately obvious how to make the story interesting to someone who isn't already familiar with Lie groups or the Atlas project.

2.1. **The "Hooks".** Things started to look up when we identified aspects of the $E_8$ result which could possibly serve as the focus of a story. Instead of looking for new ways to explain the mathematics, we started to focus on some of the less mathematical aspects that people may find interesting. These "hooks" would form the basis for our contacts with journalists, and additional information would be made available on a website we were developing. We identified the following hooks:

- $E_8$ is a beautiful symmetric object. Mathematics gives us a way to understand beauty that is beyond our direct perception.
- The answer is enormous. If written out in small print, the answer would cover 50 square miles. Other scientific studies have analyzed large amounts of data, but this result is distinguished by the nature of the answer, and its enormous size.
- It took a team effort to make this breakthrough. This large collaboration is in contrast to the typical approach in mathematics.
- This result will have implications for future research. Lie groups and their representations are fundamental tools in several areas of mathematics and the other sciences. For instance, it is possible that the $E_8$ result could have implications for string theory.

It turned out that there was yet another hook we hadn't considered: $E_8$ was discovered 120 years ago, and now we are a lot closer to understanding it. Many reporters took this to mean (incorrectly) that the Atlas team had "solved a 120 year-old problem."

And there was one hook we decided not to use. Fokko du Cloux was the primary author of the computer code used for the $E_8$ calculation, but he died of ALS[1] shortly before the calculation was completed. This certainly had the potential to be a big "human interest" story. But we decided not to emphasize that aspect, out of concern that it would appear exploitive or would detract from the mathematics.

Kat Snow, from KQED radio, explained the terminology of "hooks" to us.

2.2. **The $E_8$ website.** The main source of information would be a press release and an accompanying website that Adams and Farmer were developing.

The press release and the website would both start with the same paragraph consisting of four sentences: one for each of our hooks. We figured this would maximize the chance of people wanting to read further. The press release would be prepared last, condensed from material on the website. The opening paragraph was written at least 10 times by several people. Eventually we made a composite from the best sentences of the various efforts.

The plan for the website was a main page written at the level of a newspaper article, with links to more detailed information. Our first attempts were deemed incomprehensible by our

[1]Amyotrophic Lateral Sclerosis, also known as "Lou Gehrig's disease."

test audience (Boxer Baker and our non-mathematical friends and relatives), so that text was moved to the supplementary pages.

We also needed some quotes for the story, both from outside experts and from the people involved in the project. Conrey contacted outside people to ask for quotes, and in some cases he condensed (with permission) a longer email into a more quotable blurb. The quote by Peter Sarnak, from Princeton, gave credible evidence that the result was important, and set the $E_8$ result in the wider context of Lie groups and their representations. The quote by the physicist Hermann Nicolai, from the Max Planck Institute, gave evidence that the work was interesting to more than just mathematicians. Both of those quotes were important for gaining the attention of science writers.

Preparing all the material for the website and the press release took an enormous amount of effort, but we knew that it was just a matter of putting in enough time. More problematic was finding a "picture" to go with the story. Almost every newspaper and magazine article has a picture to go with it, so we needed a graphic for the $E_8$ story.

2.3. **A "picture" of $E_8$?** Early versions of the $E_8$ website had a picture of the $E_8$ Dynkin diagram and the crystal graph of the adjoint representation of the Lie algebra of $E_8$, as well as a photograph of (most of) the Atlas team. These were inadequate accompaniments for the news story because they didn't seem likely to capture people's interest.

Conrey set himself the task of finding a good $E_8$ graphic. He began in February, but a few weeks of poking around amounted to nothing: nobody knew of anything related to $E_8$ and nobody had any new ideas. Conrey decided that John H. Conway, from Princeton, was his best hope. If he could get Conway working on the problem, then we would have our graphic. With less than a week to go before the press release, time was running out.

2.4. **Bringing the pieces together.** Six days before the release date we had a conference call with the press offices from Cornell, Maryland, Michigan, MIT, and Utah; each of those universities had a faculty member directly involved with the $E_8$ calculation.

Since it would take a lot of time for a reporter to write a story on something this complicated, the press release would be sent out on Wednesday, March 14, embargoed until 11pm Sunday, March 18. This means that reporters have access to the news release and can begin background work, but agree not to publish anything until after the embargo date. This is common practice for science stories and this is how newspapers have stories on medical breakthroughs appearing on the same day the research article appears in a medical journal. So, this left us with only two more days to work on the release.

The people from the press offices were critical of some of our ideas. Admittedly, some of those criticisms had been brought up by Boxer Baker. But she was one person against three, and now there were five more people on her side. A key decision during that call was the headline for the press release: A Calculation the Size of Manhattan. This was suggested be Lee Siegel from Utah. The people with press experience also made clear the need for an interesting graphic, which re-energized Conrey's quest for a picture of $E_8$.

The press release would go out on *Eurekalert*, a service for press releases in science and technology to which most science writers subscribe. Bulletins come out as a headline followed by one or two sentences, so it was important that the headline grab the writers' attention.

2.5. **We find a picture of $E_8$.** In the late evening of Thursday, March 15, Conrey calls Conway at home and offers him pretty much anything he wants if he can come up with a graphic by Sunday night, the time the press release is made public. Conway says there is

no way he can come up with something by Sunday, but there may be a usable drawing by Peter McMullen in Coxeter's book *Regular Polytopes*. He tells Conrey to call him tomorrow at the Common Room of the Princeton math department (Conway's "office").

On Friday morning Conrey flipped through Coxeter's book and described the pictures to Conway. The book is about polytopes, not Lie groups, and he needed Conway to make the connection. None of the pictures was right. It turned out that it was the wrong book. So Conrey and AIM's librarian, Ellen Heffelfinger, went to the Stanford library and checked out Coxeter's *Complex Regular Polytopes*. This has a drawing by McMullen, but it isn't quite the right one. This one is missing 240 lines out of the approximately 10,000 lines in the correct drawing. They figured nobody would notice. Conrey had the picture scanned and sent around to the Atlas team. So now we have our graphic!

But then Heffelfinger found the correct picture in a paper by Coxeter. It is a drawing by McMullen of the *Gosset polytope* $4_{21}$, which happens to be the convex hull of the root vectors of the Lie algebra $E_8$. This is a step or two removed from a picture of the split real form of the Lie group $E_8$, but we were out of time and it really was a beautiful picture. John Stembridge, a member of the Atlas team, quickly figured out the connection between $4_{21}$ and the $E_8$ root system and made a high-resolution color version of McMullen's diagram. Stembridge's colorful depiction of the $E_8$ root system became the icon associated to the story. We believe the picture was crucial to the story gaining the attention of the popular media.

2.6. **The press release is out.** The press release went out on *Eurekalert* very late on Wednesday. There had been earlier contact with reporters, primarily initiated by us. But the appearance of the embargoed release sparked new interest, and Adams and Conrey had more work to do corresponding with reporters. According to Adams, "On Thursday the 15th I did something I never thought I would do. I was on the phone with Brian, and my cell phone rang. I answered it and got back to Brian and said, 'Sorry, I have to go. The New York Times is on the other line.' " Things were looking up: we were reaching the science and technology publications we had set as our target. We didn't know that the story was about to reach a wider audience.

Curiously, late Sunday night, 30 minutes after the embargo was lifted, Google found two websites with the $E_8$ story: MIT (which was expected) and Iran TV. This was the first clue that something unusual was happening.

## 3. Two days of news

Monday and Tuesday were about as close to a media frenzy as one could expect for a math story. The Monday activity was primarily centered at MIT where the Atlas group was meeting. On Tuesday, the focus shifted to AIM where things were already busy because we were in the middle of the workshop "Representations of surface groups."

Those days were a blur and we can't vouch for the accuracy of the next two sections.

3.1. **Monday.** The Atlas group had planned one of their regular meetings for March 19-21 at MIT. Vogan's colloquium talk was deemed the "official announcement" of the $E_8$ result. Vogan made a poster, the talk was moved to a larger room, and MIT advertised it widely.

Early that morning, Adams arrived at Logan airport (at 8:00 a.m.) and spent the cab ride to MIT talking to the London Times. The reporter was not their science reporter — they didn't want the story to be too technical. At the end of the call the Times person said,

"I wish I understood this better, it sounds really neat." That was typical of what we heard from many reporters.

Adams gave his seminar talk, and then he and Vogan spent the hour-and-a-half before the colloquium answering email from reporters. At Vogan's talk there was standing room only in the 150-seat lecture hall.

Peter Trapa, another member of the Atlas team, had a radio interview in Utah. A recording was emailed to the Atlas team. We began to realize that $E_8$ had become a big story.

Adams was up until midnight talking to reporters and answering email. By then, the $E_8$ website had 40,000 distinct visitors. We had no idea whether that was a large or small number for a news story.

All this occurred in the midst of the Atlas group's workshop, which was productive despite all the distractions.

3.2. **Tuesday.** The day started with a live broadcast of Adams' interview on WBAI in New York City. Then Adams had a long telephone interview with *The Economist*.

Conrey started the day with two radio interviews, one of which was for National Public Radio (NPR). NPR kept calling back to ask more questions, and they worked on the story until 30 minutes before it was broadcast on *All Things Considered*. That interview came out particularly well, giving a clear impression that something exciting and mathematical had occurred.

The New York Times arrived and we read the story in the Science section. Somehow we found time to look through the online versions of various newspapers.

Farmer told Conrey, "Stop saying that '$E_8$ is the Mount Everest of Lie groups.' It is misleading because Mount Everest is only a little bigger than the next highest mountain, and they didn't study $E_8$ just 'because it is there.' " Twenty minutes later Conrey told us, "I just did another radio interview. They made me say the Mount Everest quote. Three times they quoted me as having said that before, so I had to give in and say it again."

Most of the day Channel 2 from San Francisco was at AIM. They interviewed Conrey, AIM Deputy Director Steve Krantz, and people from the current workshop. Oddly enough, the current workshop had some relation to representation theory, so the participants actually had something to say about $E_8$. The background to many of the camera shots was whiteboards full of mathematics from the workshop and groups of workshop participants talking math. Farmer was asked to write "something mathematical" on the board for the opening shot of the story. The quadratic formula and the Pythagorean theorem were deemed too complicated, so he decided to add fractions: $\frac{1}{6} + \frac{1}{8}$. It took him three tries to get the right answer.

$E_8$ made it onto the blogosphere. John Baez and Peter Woit's websites have particularly high-level mathematical discussions, including some more details about the result. Other sites complain that the effort on $E_8$ should have been spent trying to cure cancer.

During AIM's happy hour, Channels 7 and 11 from San Francisco showed up. It was quite a spectacle. The workshop participants were giving reports from the afternoon working groups while the camera crews were interviewing people and shooting "B-roll," which apparently refers to footage intended as the transition between the main parts of the story. The TV people don't seem to mind that the workshop was not about $E_8$.

The Channel 7 report appeared on the news on Tuesday night and again on Wednesday morning, while Channel 11 showed it on the Wednesday late news. Channel 2 did a live broadcast during the 5:30 news and the workshop participants erupted in laughter when

their group reports were interrupted by bright lights and a loud voice saying, "This is Janine De la Vega reporting live from the American Institute of Mathematics."

We assured the participants that we usually don't have these distractions during our workshops. Everyone wanted to know how we made $E_8$ into a news story. We answered, "It was a lot of work," but the truth is that we don't know how this happened.

At 10:30 that night, Conrey was dozing in front of the TV when Boxer Baker called, "I set up an interview with CNN radio, but you have to talk to them right now." Conrey was too tired to make much sense and had to repeat things several times. Good thing it was a recorded interview.

Only 21,000 distinct visitors to the $E_8$ website on Tuesday.

3.3. **Wednesday.** The excitement continued, but there was less work. We made it to the front page of Yahoo, for about an hour. The Google ranking of our $E_8$ page was way up, and the $E_8$ entry on Wikipedia has been updated to reflect the new result. The main AIM page had a higher ranking, too. This was the first time we appeared on the first page when googling "AIM."

Our biggest surprise was a mention of $E_8$ on *Good Morning America*. No interviews, but they showed Stembridge's graphic. The weatherman poked fun at it later in the program.

Then there was a message on Conrey's answering machine: "Hi, this is Jane Doe from the Associated Press. I'd like to talk to someone about the Lie group $E_8$." The AP story was picked up by hundreds of newspapers. That caused our web traffic to increase again.

3.4. **Thursday and later.** Things were still percolating. The magazine *Science* had an article by Dana Mackenzie. Adams was interviewed on camera by Al Arabiya, who plan a story dubbed into Arabic. A Canadian documentary team was going to talk to Vogan about possibly doing a story.

Keith Devlin discussed $E_8$ during his "Math Guy" segment on NPR's *Weekend Edition*.

The AIM staff and some workshop participants were interviewed for KQED's *The California Report*. (We tried to talk about AIM, but they only wanted to hear about $E_8$.)

One of the most pleasing and surprising outcomes of this saga was an address to the U.S. Congress by Representative Jerry McNerney. Representative McNerney described the $E_8$ result, commended the universities involved with the research, and explained that this work was made possible by congressional support of the National Science Foundation. He ended with the statement, "The participants are to be commended for their work that has expanded the limits of human knowledge and brings hitherto unknown beauty and power to grace our human condition."

## 4. Appendix: Lessons learned

It is impossible to draw any definitive lessons from this one experience, but we would like to share some of what we learned from the process.

4.1. **Mistakes were made.** It we had to do it again, we would do some things differently.

In our efforts to drum up interest, we tried to promote the story before we had a good idea of what to tell people. Specifically, it was a mistake to contact journalists before we had a clear idea of the "hooks" for our story and before we had good supplementary information (the $E_8$ website) to show them. We were lucky that we had a fairly long lead-time because we could get our act together and then contact them again, otherwise we would have spoiled an opportunity.

This was a beginner's mistake. One good thing was that some reporters gave us useful suggestions on how to present the $E_8$ story in a way that people would find interesting. Once we started thinking in those terms, it didn't take too long to come up with a clear picture of the hooks for the $E_8$ story.

Another mistake was failing to make a clear distinction between journalists we would like to write a story, and editors who would be happy to commission *us* to write a story. Professional mathematics organizations may be interested in publishing a story, but in many cases you have to provide the text. We somewhat overcommited ourselves and then had to ask busy people to write yet another article. This was a mistake only because of the unexpected popular attention the story received: if we had only reached the local press and the science and technology publications we were aiming for, then we probably would have been happy to do more work to publicize $E_8$.

4.2. **Positive lessons.** There are also a few things we were pleased we did. One is that we stuck to a story that was mathematical and fairly abstract. The only mention of applications was to string theory, and that probably wasn't critical to the success of the story. Many people seemed to like the abstraction of it, the 248 dimensions, and the symmetry. This renewed our belief that pure mathematics can grab the public's attention.

Another success was perseverance. Sometimes the $E_8$ website seemed as if it would never be both comprehensive and comprehensible to its intended audience. Some of the articles, the one in *Science*, for example, arose in part because Adams, Conrey, and Vogan answered reporters' questions with many long emails describing various interesting aspects of $E_8$ from several different perspectives.

4.3. **The key ingredients.** In retrospect we can see some key elements that were critical for helping the $E_8$ story to reach our intended audience. Surely those elements were also critical for helping the story to reach the popular media, but we do not claim to understand why that happened.

These items are in no particular order.

- *A catchy title.* People won't read past the headline if it doesn't capture their interest. This is certainly true for newspapers, but it is also true for a press release and on news services like *Eurekalert*.

  Finding our headline took a lot of effort. The idea of measuring the size of the answer as an area occurred to us fairly early. The answer is a matrix of polynomials with 453,060 rows and columns. If each entry was a 1 inch square, the matrix would have an area slightly more than 50 square miles, so we put that in the text of the website. Boxer Baker didn't like that description and she said we have to compare it to something people can picture, like Rhode Island. In the text of the website we wrote that the answer was "twice the size of Manhattan." Some of us had misgivings with the Manhattan comparison because the matrix is square and Manhattan is not (mathematicians can be too pedantic at times!). Initially the headline was the uninspiring (and mathematically meaningless) "Mathematicians map $E_8$." Finally, during the conference call with people from the press offices at Cornell, Maryland, Michigan, MIT, and Utah, the issue of a headline was raised. They strongly suggested "A calculation the size of Manhattan," and fortunately we agreed.

- *At least one good picture.* Stories need pictures. It didn't make sense for us to use a picture of a person, because it was a group effort. So we needed a picture of the mathematics. It seemed like a hopeless task to find a picture of $E_8$, and we didn't hit upon a good graphic until the day before the official news release.

  How we found our graphic was described earlier. It may be bothersome that the picture shows (a projection of) the $E_8$ root system, which can be thought of as the building blocks of the Lie algebra $E_8$. Admittedly, it is a few steps removed from the split real form of the Lie group $E_8$, so isn't that misleading? Trying to have complete mathematical accuracy will just paralyze your efforts. The root system picture successfully conveys the concept of a "huge beautiful symmetric object."

  A good example is the cover of the December 22, 2006, Science magazine illustrating Perelman's work on Ricci flow. The cover showed a "dumbbell" shape morphing into a sphere. The images convey some of the elements of the mathematics – it is about curvature, a change in curvature, and spheres. Unfortunately, the picture gets the mathematics wrong! If the dumbbell's surface moved in the direction of greatest curvature, it would "pinch off" in the middle, forming two spheres with cusps. This is actually a much better illustration of what Perelman did: he figured out how to handle the singularities that arise in the Ricci flow. But a picture of a dumbbell breaking into two teardrops which then morphed into spheres would (ironically) not have conveyed as accurate an impression to the average reader.

- *Resources with comprehensible background information.* Since we didn't expect a newspaper to print our news release directly as a story, we needed to provide a source for more information. One possibility is an interview by a journalist, but we couldn't count on that and we couldn't handle more than a few of those calls anyway. A website was the easiest way to provide information on *different levels*. The main part of the website was at the level of a newspaper, with links to more detailed information. On the $E_8$ website we made a deliberate effort to have the supplementary information link to another place on our own website because you tend to lose people once they follow an off-site link.

  This website was not publicly linked until the official release date, however the embargoed press release and personal emails to journalists mentioned the site.

- *Public Relations experience.* If we only expected the local papers to carry the story, then we would have handled everything ourselves. But we were hoping for a wider audience, so we needed help.

  AIM does not have a public relations department, so we hired professional help. The most obvious benefit was that we needed to come up with a plan. But a more important and more subtle issue is that we (and probably all mathematicians) don't have a clear idea of how to discuss mathematics in a way that other people find interesting. Half the effort of preparing for the news release was understanding how things should be done, and re-writing various parts of the story for the umpteenth time. If we had to do it again, it would be much faster. It also took some time for Boxer Baker, who had not worked with mathematicians before, to understand our constraints and how we do things. For example, we would claim to see a big distinction between pairs of phrases which, to her, said exactly the same thing. This made it a

challenge to write something which everyone agreed was correct and comprehensible. But left on our own, it would merely have been correct.

We also made use of the public relations office at the National Science Foundation (NSF) and at the home universities of members of the Atlas team involved with the $E_8$ calculation: Cornell, Maryland, Michigan, MIT, and Utah. A conference call with all those people was critical to the final steps of our preparations. Also, each of those universities was able to make use of their local media contacts. This was particularly important in the Boston area because MIT was hosting the official event marking the announcement of the $E_8$ result.

- *Web presence.* On the announcement day, AIM's website prominently showed the $E_8$ graphic and the beginning of the story. The NSF and the universities involved also put the story on their websites. The MIT site received a lot of traffic and referred many of the early hits to the $E_8$ page.

- *Why do we care?* Reporters want to know what the result is "good for."

  It would be nice if reporters and the general public understood the value and the potentially huge (but long-term) payoff of basic research. But most of them don't (yet), so you have to relate the result to something "practical." One of the great things about math is that everything is connected, and nearly every area of mathematics has been used for something useful. A good example is Sarnak's quote about the $E_8$ result: "Understanding and classifying the representations of Lie Groups has been critical to understanding phenomena in many different areas of mathematics and science including algebra, geometry, number theory, Physics and Chemistry."

  We also developed a "Fact Sheet" listing some statistics and factoids about the result. This is easy to read and also gives people something to latch on to. In retrospect, this should have been linked directly from the main $E_8$ page.

- *Develop multiple "hooks."* Why is the story interesting?

  At first, all our efforts went into finding ways to explain the mathematics. An important step was realizing that there are interesting things about the $E_8$ story that don't require an explanation of what the Atlas team actually did. Once we had a clear idea of our hooks, it was easier to talk to people about the story.

- *Associate the news release with an event.* David Vogan was scheduled to give a colloquium talk at MIT on Monday, March 19, so we chose that for our release date.

- *Lots of quotes.* A dry narrative becomes more interesting when a real person is talking, so we needed some quotes.

  People not associated with the project can say things that the people on the project cannot. Most mathematicians will not describe their own work as "exciting" or "important," so we had to find other people to say it. Also, nobody on the Atlas team wanted to speculate about applications of their work to physics, so we had to find a physicist to talk about that. The quotes from Sarnak and Nicolai were instrumental here.

One thing we were told (and still find hard to believe), is that in the press release the quotes from the researchers should come up early, with supporting quotes from outside experts to appear later. Apparently mathematicians think the outside quotes are important for establishing that the result is worthwhile, but reporters just want to get the story as fast as possible.

- *Availability of key personnel.* Adams, Conrey, and Vogan were quick to reply to questions from reporters and requests for interviews. There wouldn't have been any articles if they didn't go to the effort to give fast and thorough answers to email questions and to promptly return telephone calls.

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