The announcements of the Nobel Prizes in the early fall are familiar to all. The subsequent events in Stockholm, where the prizes are awarded annually on December 10—the anniversary of the death of Alfred Nobel—are less widely known. I had the good fortune to witness the breadth and grandeur of these activities in 2006. This remarkable experience arose because John Mather and George Smoot, my colleagues on NASA’s Cosmic Background Explorer (COBE) mission, received the 2006 Nobel Prize in Physics “for their discovery of the blackbody form and anisotropy of the cosmic microwave background radiation.” To extend and expand the celebrations, I offer this personal account of the COBE team’s rendezvous in Stockholm, which started over 32 years ago.

The COBE mission

Within days of joining NASA in 1974, I received a phone call from John Mather, a young post-doc at the Goddard Institute for Space Studies (GISS). He invited me to participate in a meeting to consider responding to a NASA Announcement of Opportunity by proposing a mission to study the cosmic microwave background (CMB) radiation. At the meeting at GISS on September 27, 1974, John Mather, Patrick Thaddeus, David Wilkinson, Rai Weiss, and I discussed the state of measurements of the spectrum and anisotropy of the CMB, and the desirability of searching for the cosmic infrared background (CIB). We discussed the likely limitations of future measurements from sub-orbital platforms and the case for a space mission. We agreed to propose a mission—“Cosmological Background Radiation Satellite”—to measure the CMB and search for the CIB.

NASA received other proposals to measure the CMB anisotropy from a team at JPL led by Sam Gulkis, and a team from UC Berkeley led by Louis Alvarez and including George Smoot. At first, NASA did not respond to these proposals, because a study of the IRAS mission was underway and a second infrared astronomy mission seemed unnecessary. Nevertheless, Nancy Boggess, the Program Scientist for Infrared Astronomy at NASA Headquarters, understood the importance of the science of the CMB and CIB, and invited me to NASA Headquarters to help explain the opportunity to other managers. I recall pointing out during those discussions that this mission could produce Nobel Prize science. Would that I could always be that prescient (or at least bold)!
NASA proceeded to approve a mission definition study, and eventually developed and carried out the COBE mission. Books by John Mather and John Boslough (The Very First Light) and George Smoot and Keay Davidson (Wrinkles in Time), as well as an article by Bertram Swartzchild in Physics Today (December 2006, pp. 18–22), chronicle the intervening years of toil, the tragedy of the Challenger disaster, and the ultimate triumph of the COBE mission.

The three instruments on COBE strongly resembled the 1974 suite sketched by the Mather team: Far Infrared Absolute Spectrophotometer (FIRAS) to measure the CMB spectrum, Differential Microwave Radiometers (DMR) to search for CMB anisotropy, and Diffuse Infrared Background Experiment (DIRBE) to search for the CIB. These instruments exceeded all of our scientific aspirations.

The definition team for the COBE mission initially included Mather, Weiss, Wilkinson, Smoot, Gulkis, and myself. Over the course of time, the COBE Science Working Group (SWG) grew to 19 members, comprising the co-investigators for all three instruments. The SWG was a cohesive and congenial group, collectively responsible for the scientific success of the COBE mission. One of my great pleasures in participating in the mission was laboring shoulder to shoulder with such extraordinarily talented individuals.

As listed in the Mather and Boslough book, some 1500 people contributed to the COBE success.

On to Stockholm

I was delighted by the announcement from Stockholm on the morning of October 3, 2006, that John Mather and George Smoot had been awarded the Nobel Prize in Physics. They were being honored for the COBE determination that the CMB has a precise blackbody spectrum,¹ dramatic confirmation of the Big Bang scenario of cosmic evolution, and the discovery of its anisotropy,² providing a quantitative measure of primordial inhomogeneities in density which led to the growth of the cosmic structures seen in the universe today. I was particularly excited, because in 1976 I had recruited John to come to GSFC to pursue the COBE mission, and now he was the first NASA employee to receive a Nobel Prize.

Each Nobel laureate received a quota of 16 tickets to the ceremonies, and thanks to the generosity of John and George, all members of the COBE SWG and many of their spouses were able to attend, including my wife Deanna and myself. We departed Baltimore on Monday, December 4, equipped with cameras and arrangements for the requisite formal wear, to reach Stockholm in time for the full experience. Starting December 6, a series of receptions, lectures, luncheons, dinners, and a concert led up to the prize ceremony itself (Table 1).

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Upon arriving at the Grand Hotel Stockholm on Tuesday, we were immediately impressed with the elegance and orderliness of the arrangements. In the lobby of this five-star hotel was a Nobel desk, staffed throughout the week by the Nobel Foundation, offering ready assistance to all participants. We were given a booklet containing John Mather’s schedule and a bus schedule, so we would know when to be ready to travel to each event to which we were invited. Meanwhile, each laureate had a personal attendant and a limousine to transport them and their families.

The first organized event was an informal reception at the Nobel Museum on Wednesday, December 6. Here, laureates and guests were briefed on the importance of the Nobel Prizes to Sweden and its students. We heard a brief account of Alfred Nobel’s life, and were shown a movie of past award ceremonies so we would know what to expect on December 10. The formalities are unchanged from year to year. The Museum exhibits include a rotating display of pictures of each of the preceding 703 Nobel laureates, and a display of typical place settings for the Nobel banquet.

Taking advantage of the unscheduled afternoon after a light lunch at the Nobel Museum visit, I went to check the fitting of the formal wear I had rented by e-mail. The conversion of my measurements to metric units had been a success, and all was in good order. White tie and tails were required attire for men at the formal events. National medals were encouraged. For women, it was ball gowns, with tiaras “appreciated.”

At a press conference Thursday morning at the Royal Swedish Academy of Sciences, the laureates in physics and chemistry, and the winner of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, were queried about their research, about their advice to students, and particularly about why Americans win so many Nobel Prizes. (Responses to the latter question...
mentioned the quality of our educational system, the level of funding available, and the flexibility to form collaborations within and between institutions, even worldwide, to address research problems.)

Each Nobel laureate delivers a lecture prior to the award ceremony. The first of these was the literature lecture given Thursday afternoon by the Turkish writer Orhan Pamuk. We were fortunate to be able to obtain tickets, since the ornate room in the Royal Swedish Academy of Sciences where it was held is only modest in size. As we were about to board the bus, we learned that the lecture would be delivered in Turkish! Fortunately, printed copies were available in English and several other languages. In his lecture, Pamuk provided a moving account of why and how he writes. Though photographs were not permitted during the lecture (nor during any of the major events), I captured the setting prior to the talk.

The physics lectures were delivered on Friday morning in an auditorium at Stockholm University, which enabled a large audience to attend, including many students. John Mather gave a review of the COBE project, showing pictures of the scientists involved, and describing the purpose and results of measuring the CMB spectrum. George Smoot focused on the CMB anisotropy. In contrast to the literature lecture, which was read, the science laureates used PowerPoint presentations. All the Nobel lectures can be viewed from the web (http://nobelprize.org/award_ceremonies/lectures.html).

The Nobel concert Friday evening was a magnificent event held at the Stockholm Concert Hall, attended by the Swedish royal family and enjoyed by a full house. The renowned American opera star Renée Fleming was the featured performer. With the Royal Stockholm Philharmonic Orchestra, she performed a largely operatic program, but ended with lighter fare from Gershwin and the musical theater. The audience demanded five encores and more, but Ms. Fleming stopped after five, commenting that she had been told to expect that Swedish audiences would be reserved! Later, she came back to the Grand Hotel and attended a buffet dinner for concert attendees. Some of the COBE group had the pleasure of meeting and talking with her.

On Saturday morning I had the privilege of accompanying the laureates to the library in the royal palace for the taping of the “Nobel Minds” TV program, which was to be broadcast on the BBC network later in December. Participants included the Nobel laureates in physics, chemistry, physiology or medicine, and the economics prize winner. After an introduction to the royal library, the guests were taken on a tour of many beautiful rooms in the palace while preparations were made for the

Figure 9: Preparing for the Nobel lecture for literature.

Figure 10: Professor Per Carlson, Chairman of the Nobel Committee for Physics of the Royal Swedish Academy of Sciences, congratulates George Smoot and John Mather following their Nobel Lectures.

Figure 11: Entrance to the Stockholm Concert Hall for the Nobel Prize Concert.
taping—which we then watched in a separate room via closed-circuit TV. The interviewer engaged
the laureates in lively discussion in response to questions posed from around the world.

Following the taping, the American laureates, accompanied by their guests, attended a luncheon
at the residence of the U.S. Embassy. Since almost all of the laureates of 2006 were
American, this was quite a large gathering, requiring tables in three rooms. The recently
arrived ambassador, Michael Wood, toasted the laureates, quoting President Bush, who
said on the occasion of the 100th anniversary of the Nobel Prizes in 2001, “...many awards
recognize excellence. The Nobel Foundation recognizes greatness. The annual selection of
laureates expresses a profound optimism about humanity and our prospects for improvement.”

Later that afternoon, all of the laureates
and their guests attended a reception hosted
by the Nobel Foundation in the great central
hall of the Nordic Museum. The mood was
enhanced by the presence of live background
music, light refreshments, and champagne.

Prior to going to Stockholm, the COBE
team had agreed that we would find a time to
get together to celebrate privately. Saturday
evening was the only opportunity when no
other event was scheduled and all attendees
would be in Stockholm. Following the reception
at the Nordic Museum, 34 of us gathered in a
room at the Wedholms Fisk restaurant, a few
blocks from our hotel, for coffee, dessert,
more champagne, and a lot of reminiscing.

At this gathering, we agreed that we should
meet again on Sunday at the hotel, prior to
departure for the Nobel Prize ceremony, to
take group pictures in our formal attire. We
attempted to arrange ourselves as we had
been in our picture from the 1980s—a result
imperfectly achieved. Nevertheless, we could
take a group picture of our spouses, a first in
any garb.

The scheduled events on Sunday were the
highlights of the week. First was the Nobel
Prize ceremony itself, held at the Stockholm
concert hall. At this traditional, elegant
ceremony, the work of each laureate in turn
was described in Swedish, with translations
in the programs. The laureate was then called
to the center of the stage, where King Carl
XVI Gustaf presented the Nobel medal and
shook his hand. Then, the laureate stepped
back, bowed to the king, turned and bowed to
the members of the Royal Swedish Academy
of Sciences, turned again and bowed to the
audience, all while accompanied by a trumpet
fanfare. Between prize categories, the Royal
Swedish Philharmonic Orchestra provided a
symphonic interlude. The physics prize being
the first awarded, John Mather was the first to
receive his prize, followed by George Smoot—
dramatic moments for their many colleagues
assembled there. This moving ceremony was
televised and web cast live, and can be viewed

Following the award ceremony, we were transported to the Blue Room of the Stockholm City Hall for the comparably grand Nobel Prize banquet. The royal family, laureates, their spouses, and other guests of honor sat at a long central table, flanked on both sides by tables seating the remainder of the approximately 1300 guests. Simply finding one's assigned seat—using a booklet akin to a small-town telephone directory—was an adventure.

The evening began with the entrance of the royal family and guests of honor down the grand staircase, led by a group of students. The entire setting was exquisite, especially the beautiful table settings and the formal attire of the guests, most notably the gowns and jewelry of Queen Silvia, Crown Princess Victoria, and Princesses Madeleine and Christina. Prince Carl Philip was also present, but his attire was like that of the other men present. The Director of the Nobel Foundation, Marcus Storch, began with a champagne toast to the King, and the King followed with a toast to Alfred Nobel. Hundreds of white-clad waiters then marched down the grand staircase, dispersed to the tables, and began to serve the guests nearly simultaneously—a stirring performance.

John Mather sat next to the Queen, and his wife Jane sat next to the King. No doubt heady stuff for a civil servant and his wife!

Between courses of the meal there was entertainment: modern dance numbers performed on a landing of the grand staircase. At the end of the meal, several laureates made short statements. John Mather rose to emphasize graciously that the COBE achievements were the result of the combined efforts of a large team. At the conclusion of the banquet, all present proceeded up the staircase to a ballroom on the next floor for dancing.

One final event topped off the night for some 500 lucky ticket holders: the Nobel nightcap event, which began at midnight. Not sponsored by the Nobel Foundation, this annual tradition is organized by the students at a local academic institution. This year it was held at the Stockholm School of Economics, and the theme was “light.” The students issued invitations that promised “...an unforgettable night of flair, food and fun. Drink, dance and discover our fabulous light as excitement continues throughout the night.” The students delivered on their promises, though I cannot personally vouch for the throughout-the-night part. All in all, December 10, 2006 was one of the most memorable days of my life.

Deanna and I dragged ourselves out of bed Monday morning, our last day in Stockholm, for the Nobel Foundation’s bus tour of the city and a visit to the famed Vasa Museum. The Vasa was a 17th
century wooden Swedish warship, intended to be the pride of the fleet, but it proved unstable and sank within minutes of its launching. It was recovered intact following its rediscovery in the 1960s, undamaged by its 300 years in cold water. Following years of clean-up and restoration, the museum was built around it.

We joined a group of ten COBE colleagues for a traditional Swedish Christmas smorgasbord in the evening, beginning with a choice of 18 ways to prepare herring and ending with a dazzling display of desserts. The laureates had another formal dinner that evening, this time at the palace. Their stay in Sweden extended another several days, with events including visits to various Swedish academic institutions.

Beyond the receptions and hoopla, what are the lasting impressions of my Nobel experience?

First, I feel great admiration for the dignified manner in which the laureates are honored, and for the pride of the Swedish in being the agents of these recognitions. One cannot help but be impressed by the widespread public interest represented by media coverage in newspapers, live TV coverage of the award ceremony and banquet, and recorded coverage of the concert and numerous interviews. Everywhere, the laureates were treated like rock stars, with people lining up to catch a glimpse and even perhaps to get an autograph.

Second, I was impressed by the conscious plan to bring students into close contact with the laureates in celebratory events, at the lectures, and in visits to various academic institutions. The organizers clearly recognize and exploit this golden opportunity for educational stimulation and outreach.

Finally, I am deeply gratified by the dramatic affirmation of the spirit of the COBE team in these events. Of the 18 surviving members of the COBE Science Working Group (sadly, David Wilkinson is deceased), 14 attended the ceremonies, most with spouse and some with children. In addition, Dennis McCarthy, the COBE Project Manager, Mike Ryschkewitsch, a senior cryogenics engineer during the mission and now Deputy Director of Goddard Space Flight Center, and Al Kogut and Dale Fixsen, participating scientists that had key roles in the mission, attended. The evident mutual pleasure of our all being together again reminded me that the labor of creating the COBE mission and bringing it to a successful scientific conclusion was a powerful bonding agent, persisting over decades. John Mather was exactly right when he took every opportunity to stress that COBE was a team effort. Stockholm was a magical celebration of teamwork. 

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Figure 18: Stockholm Concert Hall awaiting entrance of the speakers (blue chairs, right), Royal Family (gold chairs) and Nobel laureates (red chairs) for presentation of the 2006 Nobel Prizes.

Figure 19: Grand staircase in the Stockholm City Hall leading down to the Blue Room from the ballroom (shown at the end of the Banquet).