The Earth System Initiative was launched just a little bit less than two years ago here at the Institute. It brings together people from across disciplinary boundaries, in keeping with the theme of today’s meeting. In particular, it helps bridge the gap that sometimes exists— I think, unfortunately— between the School of Science and the School of Engineering here at MIT.

We came together in this initiative, basically, because we feel that there is a critical need to understand more about the nature of the earth system, about the history of our home world, and about its current state. Perhaps just as important is that a sense of Earth history and a knowledge of the health of the planet at present are important contexts for thinking about the future of Earth, and what our role is in deciding upon that future.

Although we do things that cut across many scales of space and time as part of the Earth System Initiative, I’d like to focus today on the present and address the need to characterize better our natural world. If you think about the way we’ve approached this problem in the past, most investigations of the natural world have emphasized categorization. Frequently, they have been exercises in taxonomy. What are the creatures that live in a particular ecosystem? How have living
communities in those ecosystems changed over time scales ranging from years to millions of years? Recently, we have become more and more sophisticated in the way we approach those problems. We’re thinking about the genomics of entire ecosystems now. That’s a really exciting field, but I think it just sets up the more central scientific problems of ecosystem science: how did specific ecosystems come to be, how do they behave, and how do they evolve?

I’m sure that many of you have taken an ecology course somewhere along the way in your lives. One of the main themes of such subjects is the notion that the behavior of an ecosystem is defined by the way energy moves through that ecosystem. That’s all well and good, but – when you think about it -- it’s almost more belief than observation. In most ecosystems, we have little empirical evidence of how energy is transmitted through the ecosystem and how it might be transformed along the way. We think we might know, but it’s mostly theory rather than observation. So, how do you get the information necessary to test your hypotheses? If it’s a process that you wish to understand, taxonomy – even community taxonomy – isn’t good enough.

Luckily, we’re entering an age when we finally have the technology necessary to address some of these fundamental scientific problems. We can look at ecosystems from spaceborne platforms and focus on enormous scales. We can generate a tremendous amount of information over a very short amount of time regarding what’s happening in a particular ecosystem: what chemical fluxes are like, how physical change occurs, etc. We also can look at very, very small scales using
technologies that were not available a decade ago, or even two years ago, to try and understand processes at a very small scale in ecosystems.

The big problem right now is that there is not enough communication between the people who have the capacity to develop and implement the technology and the scientists who need to use that technology. There’s probably no place in the world better suited than MIT to be able to bridge that gap. In a nutshell, that’s why the Earth System Initiative is so exciting.

I would like to invite you to think about how we might come together and work on such projects in the future. This is such an enormous problem that there is tremendous opportunity for collaboration among earth scientists and engineers who are on the cutting edge of developing technology, ranging in scale from nanotechnology to spaceborne platform observation. An emerging issue is how to deal with very large datasets. If we are successful in gathering data over a variety of spatial and temporal scales, how do we deal with it all? It’s hard for me to imagine a ten-year record of process in a single ecosystem, let alone in a global ecosystem. The great challenge before us is not just to find ways to measure, but also to deal with the data that’s produced in an effective way.

That’s basically all I want to say today, but I’m very enthusiastic about talking to anyone who’s interested in the sort of things we’re working on at ESI. And I’d love to invite you to become a part of ESI, if you’re not already. Thanks.