

OPINION

Engineering Is Not Science

And confusing the two keeps us from solving the problems of the world

By HENRY PETROSKI / DECEMBER 2010



Illustration: Harry Campbell

In political discourse, public policy debates, and the mass media, *engineering* is often a synonym for *science*. This confusion might seem an innocuous shorthand for headline writers, but it can leave politicians, policymakers, and the general public unable to make informed decisions about the technical challenges facing the world today.

Science is about understanding the origins, nature, and behavior of the universe and all it contains; engineering is about solving problems by rearranging the stuff of the world to make new things. Conflating these separate objectives leads to uninformed opinions, which in turn can delay or misdirect management, effort, and resources.

Take this year's oil spill in the Gulf of Mexico. No one, to the best of my knowledge, blamed it on science. Poor engineering decisions allowed gas to escape from a well in deep water, which in turn caused a fatal explosion.

Subsequently, the engineered blowout preventer failed, and for months oil escaped into the environment. Poor engineering got us into the mess; surely only good engineering could get us out of it. Yet repeatedly, government and other research scientists were allowed to veto the engineering tactics needed to stanch the flow. In the end, of course, it was engineering that finally capped the well.

While not all of the technological challenges facing the world today require the same immediate attention as a gushing oil well—some are as mundane as developing renewable energy sources, providing clean water, and disposing of our mountains of garbage—they still present the same duality.

Scientists might argue that the government needs to invest in basic scientific research that will lead to unspecified discoveries about energy, water, and waste. Although a good deal is already known about those things, it certainly would not hurt to know more, but what would really move things forward would be investments in engineering.

Throughout history, a full scientific understanding has been neither necessary nor sufficient for great technological advances: The era of the steam engine, notably, was well into its second century before a fully formed science of thermodynamics had been developed. Indeed, sometimes science has impeded progress. Had Marconi believed his physicist contemporaries, he would have "known" that wireless telegraphy signals could not be sent across the ocean, around Earth's curvature.

Engineers welcome any and all available scientific knowledge, but they needn't wait for scientists to give them the go-ahead to invent, design, or develop the machinery to advance technology or to check it when it runs out of control. Without understanding this, we will continue to underfund the engineering needed to solve our greatest problems.

About the Author

Henry Petroski, a professor of engineering and history at Duke University, is the author of 14 books and numerous articles. His most recent book is *The Essential Engineer: Why Science Alone Will Not Solve Our Global Problems* (Knopf, 2010).