

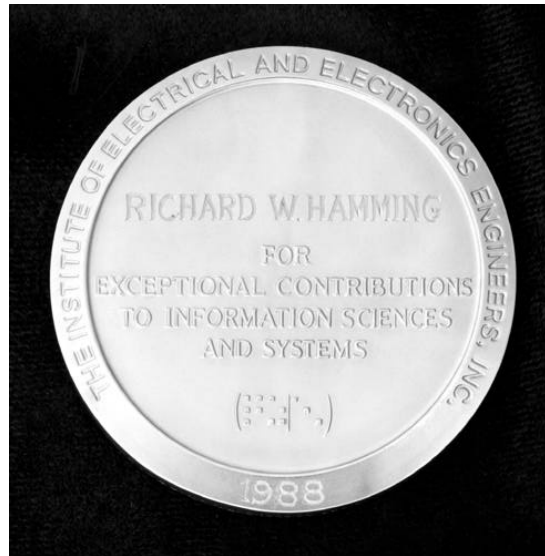
# You and Your Research

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# Richard W. Hamming, 1915–1998

- Los Alamos, 1945.
- Bell Labs, 1946–1976.
- Naval Postgraduate School, 1976–1998.
- Turing Award, 1968. (Third time given.)
- IEEE Hamming Medal, 1987.



## It's not just luck

“Say to yourself, ‘Yes, I would like to do first-class work.’ Our society frowns on people who set out to do really good work. You’re not supposed to; luck is supposed to descend on you and you do great things by chance. Well, that’s a kind of dumb thing to say.”

— Hamming

“Luck favors the prepared mind” — Pasteur

“If others would think as hard as I did, they would get similar results”

— Newton

# Brains and Courage

“How about having lots of brains? It sounds good. Most of you in this room probably have more than enough brains to do first-class work. But great work is something else than mere brains.”

— Hamming

“One of the characteristics of successful scientists is having courage. Once you get your courage up and believe that you can do important problems, then you can. If you think you cant, almost surely you are not going to.”

— Hamming

## Turn a problem into an asset

“Early on it became evident to me that Bell Laboratories was not going to give me the conventional acre of programming people to program computing machines in absolute binary. . . . I finally said to myself, ‘Hamming, you think the machines can do practically everything. Why can’t you make them write programs?’ What appeared at first to me as a defect forced me into automatic programming very early. What appears to be a fault, often, by a change of viewpoint, turns out to be one of the greatest assets you can have.”

— Hamming

# Knowledge accumulates like compound interest

“One day I discovered that John Tukey was slightly younger than I was. John was a genius and I clearly was not. Well, I went storming into Bode’s office and said, ‘How can anybody my age know as much as John Tukey does?’ He leaned back in his chair, put his hands behind his head, grinned slightly, and said, ‘You would be surprised Hamming, how much you would know if you worked as hard as he did that many years.’ I simply slunk out of the office!

“What Bode was saying was this: ‘Knowledge and productivity are like compound interest.’ Given two people of approximately the same ability and one person who works ten percent more than the other, the latter will more than twice outproduce the former. The more you know, the more you learn — it is very much like compound interest. I dont want to give you a rate, but it is a very high rate.”

— Hamming

## What are the important problems?

Hamming started to eat at the Chemistry table. “I started asking, ‘What are the important problems of your field?’ And after a week or so, ‘What important problems are you working on?’ And after some more time I came in one day and said, ‘If what you are doing is not important, why are you working on it?’ I wasn’t welcomed after that. “In the fall, Dave McCall stopped me in the hall and said, ‘Hamming, that remark of yours got underneath my skin. I thought about it all summer. I haven’t changed my research, but I think it was well worthwhile.’ I noticed a couple of months later he was made the head of the department. I noticed the other day he was a Member of the National Academy of Engineering. I have never again heard the names of any of the other fellows.”

— Hamming

## Develop reusable solutions

“How do I obey Newtons rule? He said, ‘If I have seen further than others, it is because I’ve stood on the shoulders of giants.’ These days we stand on each other’s feet!

“Now if you are much of a mathematician you know that the effort to generalize often means that the solution is simple.

“I suggest that by altering the problem, by looking at the thing differently, you can make a great deal of difference in your final productivity because you can either do it in such a fashion that people can indeed build on what you’ve done, or you can do it in such a fashion that the next person has to essentially duplicate again what you’ve done.”

— Hamming



## Sell your work

“I have now come down to a topic which is very distasteful; it is not sufficient to do a job, you have to sell it. ‘Selling’ to a scientist is an awkward thing to do. It’s very ugly; you shouldn’t have to do it. The world is supposed to be waiting, and when you do something great, they should rush out and welcome it. But the fact is everyone is busy with their own work. You must present it so well that they will set aside what they are doing, look at what you’ve done, read it, and come back and say, ‘Yes, that was good.’ If they don’t stop and read it, you won’t get credit.”

— Hamming

# Computing and Society

**Identity cards.** What is the right way to balance accountability with privacy?

**Communication and mobility.** What happens when mobile phones merge with computers merge with the internet merge with GPSR?

**Trust and reliability.** How can you safely download new software to your car?

- Computer Professionals for Social Responsibility (CPSR), [www.cpsr.org](http://www.cpsr.org).
- Risks to the Public in Computers and Related Systems, Peter G. Neumann, [catless.ncl.ac.uk/Risks](http://catless.ncl.ac.uk/Risks).

# Informatics

“In their capacity as a tool, computers will be but a ripple on the surface of our culture. In their capacity as intellectual challenge, they are without precedent in the cultural history of mankind.”

— Edsger Dijkstra

“Computer Science is no more about computers than astronomy is about telescopes.”

— Edsger Dijkstra

Alan Bundy is organizing a series of lectures on *Computational Thinking*.

# Communication skills

- *The Elements of Style*, Strunk and White.
- *The Visual Display of Quantitative Information*, Tufte.
- *Envisioning Information*, Tufte.
- *Visual Explanations*, Tufte.
- Any well-written fiction.

You don't need luck, but you are lucky!

The computer age is barely half a century old.

Computers have yet to find their Galileo, Newton, or Kepler.

It could be you!