

## **KEVIN KELLY**

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### **The Virtues of Negative Results**

We can learn nearly as much from an experiment that does not work as from one that does. Failure is not something to be avoided but rather something to be cultivated. That's a lesson from science that benefits not only laboratory research, but design, sport, engineering, art, entrepreneurship, and even daily life itself. All creative avenues yield the maximum when failures are embraced. A great graphic designer will generate lots of ideas knowing that most will be aborted. A great dancer realizes most new moves will not succeed. Ditto for any architect, electrical engineer, sculptor, marathoner, startup maven, or microbiologist. What is science, after all, but a way to learn from things that don't work rather than just those that do? What this tool suggests is that you should aim for success while being prepared to learn from a series of failures. More so, you should carefully but deliberately press your successful investigations or accomplishments to the point that they break, flop, stall, crash, or fail.

Failure was not always so noble. In fact much of the world today failure is still not embraced as a virtue. It is a sign of weakness, and often a stigma that prohibits second chances. Children in many parts of the world are taught that failure brings disgrace, and that one should do everything in one's power to succeed without failure. The rise of the West is in many respects due to the rise in tolerating failure. Indeed many immigrants trained in a failure-intolerant culture may blossom out of stagnancy once moved into a failure-tolerant culture. Failure liberates success.

The chief innovation that science brought to the state of defeat is a way to manage mishaps. Blunders are kept small, manageable, constant, and trackable. Flops are not quite deliberate, but they are channeled so that something is learned each time things fell. It becomes a matter of failing forward.

Science itself is learning how to better exploit negative results. Due to the problems of costly distribution most negative results have not been shared, thus limiting their potential to speed learning for others. But increasingly published negative results (which include experiments that succeed in showing no effects) are becoming another essential tool in the scientific method.

Wrapped up in the idea of embracing failure is the related notion of breaking things to make them better, particularly complex things. Often the only way to improve a complex system is to probe its limits by forcing it to fail in various ways. Software, among the most complex things we make, is usually tested for quality by employing engineers to systematically find ways to crash it. Similarly, one way to troubleshoot a complicated device that is broken is to deliberately force negative results (temporary breaks) in its multiple functions in order to locate the actual disfunction. Great engineers have a respect for breaking things that sometimes surprises non-engineers, just as scientists have a patience with failures that often perplexes outsiders. But the habit of embracing negative results is one of the most essential tricks to gaining success.