J. Scott Armstrong (1937 - 2023): Iconoclast and Champion of Science for Practical Purposes

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The impressive career of my great friend and colleague J. Scott Armstrong has, at the time of this writing, been commemorated by Fred Collopy and Robert Fildes in their obituary of Scott in *The International Journal of Forecasting* and in the *University of Pennsylvania Almanac* (Collopy and Fildes, 2023; Editor, 2023). Fred was Scott's doctoral student and co-author with him of key papers on rule-based forecasting and on the useful measurement of forecast errors. Robert was one of the co-founders with Scott of the International Institute of Forecasters and the associated journals and annual symposium.

My involvement with Scott started more recently, though nearly a quarter of a century ago.

I was, as an aspiring midlife doctoral student, introduced to Scott's first book – *Long-range Forecasting* (Armstrong, 1985) – by Don Esslemont. Don was a director with me of a market-research company and had an important role in developing the Juster Scale as a demand forecasting tool. He had earlier hosted Scott at Massey University and described Scott to me as "the real thing." Don was right, of course.

Scott's research on role-playing to forecast decisions got my attention as a potential starting point for my PhD dissertation. I wrote to Scott to ask him about research on the topic, and to my surprise and delight the great man of forecasting research replied. (Scott later told me that he found that the top people tend to respond to genuine queries.)

Scott suggested that I have a go at comparing the accuracy of role-play forecasts with the accuracy of game theorists' forecasts, on the basis that game theorists had failed to provide evidence of their methods' predictive validity in practice.

The question was practically important. Game theory is taught in universities as a method for analysing conflicts and is promoted by consultants as a useful tool for making predictions about the operation of markets and how bargaining situations will turn out. And, by comparing the performance of two very different methods, I would be able to make recommendations about which, if either, to use in practice.

That was my introduction to Scott's two big themes: *usefulness* and *multiple reasonable hypothesis testing*. The two go together. Without fair comparisons with alternatives, usefulness is doubtful, or at least not fully determined. Practitioners' work is no exception.

When I wrote to Scott describing my results, he asked me to present them at the International Symposium on Forecasting in Atlanta in 2001 and organized commentary from senior forecasting researchers. Scott did that without yet having met me and knowing that, at that stage, I had no degree and had never been to an academic conference, nor had I written an academic paper. For Scott's confidence in his own judgement and willingness to take a chance on me, and much more such generosity of spirit since, I will be forever grateful.

That was the beginning of my collaboration with Scott in conducting useful scientific research – research that tested multiple hypotheses without fear or favor to get closer to the truth, and to find better ways of doing things. Research that, by its nature, was bound to offend established academics and other vested interest groups. Research that provided findings that are, or should be, of keen interest to practitioners who want better solutions.

Much of Scott's career had been devoted to making useful scientific findings on forecasting accessible to practitioners as well as to researchers across diverse disciplines. As readers of *Foresight* will realize better than many, making good decisions depends on accurate forecasts. And researchers know that predictive validity is a critical test of hypotheses.

Scott's book *Principles of Forecasting* (Armstrong, 2001) – with the apposite subtitle, "A Handbook for Researchers and Practitioners" – was a major effort to collect knowledge about forecasting into one

volume to provide that accessibility, and therefore usefulness. An important part of the book was the distillation of that knowledge into a checklist of 139 forecasting principles.

That publication did not stop Scott's quest to increase the usefulness of forecasting research findings. Feedback on the *Principles* book that included "139 principles is a lot!" and "Can't the findings be distilled down into some form that is less intimidating and therefore more likely to be used?" led Scott to further efforts.

Those efforts were encouraged and aided by Arch Woodside, then editor of the *Journal of Business Research*. Arch commissioned Scott to edit a special section in the journal with the theme of simplicity in forecasting, and I joined Scott in that endeavour.

Along with useful contributions by other researchers, the special section included a paper that summarised forecasting knowledge in one overarching principle, or golden rule. The Golden Rule of Forecasting is "to be conservative. A conservative forecast is consistent with cumulative knowledge about the present and the past. To be conservative, forecasters must seek out and use all knowledge relevant to the problem, including knowledge of methods validated for the situation" (p. 1717, Armstrong, Green, and Graefe, 2015).

Our paper introducing the special issue was titled "Simple versus Complex Forecasting: The Evidence." We concluded, "Our review of studies comparing simple and complex methods – including those in this special issue – found 97 comparisons in 32 papers. None of the papers provide a balance of evidence that complexity improves forecast accuracy. Complexity increases forecast error by 27 percent on average in the 25 papers with quantitative comparisons" (p. 1678, Green and Armstrong, 2015). The conclusion is consistent with the principle of science known as Occam's razor.

Scott's last great project to provide useful and accessible forecasting guidance was a paper titled "Forecasting Methods and Principles: Evidence-based Checklists" (Armstrong and Green, 2018). That paper came about as the result of another initiative by Arch Woodside that involved an award named in Scott's honor by the Korean Scholars of Marketing Science.

Don't be distracted by the "marketing science" label, which belies the broad relevance of the paper. It brings together key elements of the Golden Rule and simplicity papers, described above, with a checklist and descriptions of simple validated methods for diverse forecasting problems.

Forecasting practice, and hence decision making, would be much improved if forecasters were to stay true to the Golden Rule and used only the simple validated methods described in Armstrong and Green (2018).

In practice, incentives act against following the Golden Rule, and simple methods. Dramatic (unconservative) forecasts from opaque (complex) methods are easier to "sell," and pay better!

That conclusion is consistent with our experience in the conservative application of simple evidence-based forecasting methods to climate forecasting. Scott was to give a featured talk at the 2007 International Symposium on Forecasting in New York City and asked me what I thought the topic should be. I suggested that the UN Intergovernmental Panel on Climate Change's dangerous man-made global-warming projections could do with some attention from an evidence-based forecasting principles perspective.

Scott responded enthusiastically, and the outcome was a string of papers in which we found the hypothesis of man-made global warming that would substantively harm humankind and the natural environment was not supported by scientific forecasting. Our key papers on the topic were Green and Armstrong (2007) and Green, Armstrong, and Soon (2009). Our co-author on the latter paper was astrophysicist Willie Soon.

Perhaps we were naïve enough to think that our finding – that there was no good reason to be worried about changing climate, and therefore no need to implement expensive policies that would cause great economic harm and cut off people in poorer countries from future prosperity – would be welcomed. That was not to be.

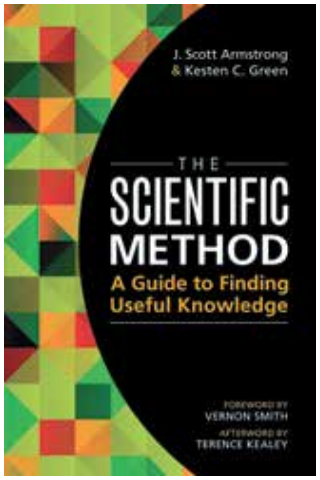
We found that government departments stopped consulting us, and we had difficulty getting our papers published in high-ranked journals. We were grateful to Spyros Makridakis – another of the co-founders of the International Institute of Forecasters – for the exception of our 2009 publication in the *International Journal of Forecasting*.

A more positive outcome was that Scott later turned his mind to what could be done to improve the practice of scientific research. That was the genesis of our book *The Scientific Method: A Guide to Finding Useful Knowledge* (Armstrong and Green, 2022). The book is akin to a map that we hope can help get scientific practice back on the usefulness track.

Part of the answer is evidence-based checklists. But checklists are only likely to be effective when they align with incentives. As our research for the book progressed, we became persuaded that strong incentives are acting *against* the proper practice of science.

The result is what we called "advocacy research": practices that superficially resemble science, but which are likely to deliver – either by commission or omission – *preferred* findings. The incentive to practice advocacy research is magnified by the monopoly-like control of research agendas by governments.

Our iconoclastic conclusion was that to revive the productivity (usefulness) of the research enterprise and to reduce the likelihood of mischievous findings, science must be liberated from governments.



To be a truly useful researcher and practitioner, one needs to be brave and willing to go against the flow when the evidence warrants, as Scott was.

The Scientific Method was Scott's last publication.

He used to say that his best work was the hardest to get published. A survey of Nobel Prize-winning economists found the same. By that measure, I hope that *The Scientific Method* – finally published by Cambridge after many restarts and much hurdle jumping – and the "Forecasting Methods and Principles: Evidence-based Checklists" paper will endure as memorials to Scott the iconoclast and champion of useful science.

Finally, Scott would I'm sure want me to tell how much he was given strength by the love and support of his family. His wife, Kay, his daughters Kathy and Jennifer, his sons-in-law Chris and Greg, and his three grandchildren will be known to many of you who have attended an International Symposium on Forecasting.

Vale, Scott. You made the best kind of difference, and you will be missed.

Publications referenced in this tribute are listed here. Scott's CV and many of his works can be found at *jscottarmstrong.com*.

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Founders of the IIF: Scott with Spyros Makridakis and Robert Fildes at ISF2012 in Boston

Lessons from a Mentor and Friend

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When I was embarking on my doctoral thesis, Scott Armstrong was a towering presence in the world of forecasting. His name would pop up everywhere in the literature, and his *Principles of Forecasting* handbook (Armstrong, 2001) always remained within reach on my desk. He seemed like a living legend.

Meeting Scott at the 2007 International Symposium on Forecasting in New York City – my first academic conference – was an unexpected turn of events. With my talk scheduled for the last session on the final day, the halls were nearly empty, and my panel had only a handful of attendees, speakers included. Undoubtedly, many had departed, while others seized the opportunity to explore Manhattan or recuperate from the previous night's gala event – an unforgettable harbor cruise.

But not Scott, who had celebrated his 70th birthday earlier that year. Armed with a meticulously curated list of talks he planned to attend, Scott deftly maneuvered between panels to ensure he didn't miss a single one. I vividly recall the thrill I experienced as he entered the room just in time for my presentation, and I silently hoped that my rudimentary validation work on Delphi and prediction markets had indeed captured his interest. And it had! Scott was highly engaged, smiled, and asked lots of questions. We kept talking for a little while after the session, and he shared many ideas for how to move my research forward. This inspiring encounter was the most critical moment in my career. I could hardly fathom that the distinguished Scott Armstrong was sincerely intrigued by the work of a young doctoral student and first-generation academic from Germany, and with no publication credits.

This was typical Scott – his brilliance was matched only by his approachability, his perpetual twinkle in the eye making every interaction warm and welcoming. Shortly after our first meeting, he invited me to co-author a paper with him and Kesten Green (Green and colleagues, 2007), and soon after, to come to Wharton as a visiting scholar. When I arrived, Scott welcomed me like a friend, inviting me to his house to meet his wonderful family, whom he always spoke of with such admiration and affection. The plan was to stay for three months. I ended up staying for two years.

I benefitted immensely from Scott's tireless mentoring. He would typically return revisions of my drafts multiple times a day, with an impressive attention to detail. Clearly, there was a wealth of knowledge for me to acquire, and Scott had the wonderful ability to share it naturally, without ever giving the impression of delivering a lecture. Under his mentorship, my research and writing skills saw remarkable improvement. Our collaboration resulted in numerous publications within the field of election forecasting. Apart from our work on combining forecasts within and across methods to reduce error (Graefe and colleagues, 2014), which he started with the PollyVote.com in 2004, Scott pioneered the conceptualization of knowledge (or "index") models. These models, introduced in Armstrong and Graefe (2011), marked a groundbreaking step as the first election forecasting models designed to facilitate decision making for campaign strategists.

I find myself regularly citing anecdotes and lessons from Scott with my students, passing on the knowledge and wisdom he so generously shared. But to me, he was so much more than just a mentor; Scott was a friend and the driving force behind my pursuit of an academic career. He recognized a passion and talent in me that I hadn't seen in myself, and he instilled in me a love for research.

Scott's legacy extends beyond his groundbreaking research, extensive publications, and numerous citations; what truly sets him apart was his remarkable ability to share knowledge with genuine humility. Beyond his intellectual prowess, he infused every interaction with a touch of joy – he was a delight to be with. I am eternally grateful for that pivotal day in 2007 in New York City and will forever hold the memory of an exceptional mentor and cherished friend.

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Scott Armstrong's Scientific Legacy

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About 10 years ago, Scott Armstrong mentioned to me what he counted as his two top articles. Both of them include shocking findings and will always be remarkably important readings. His number-one article (as a scientific contribution) is

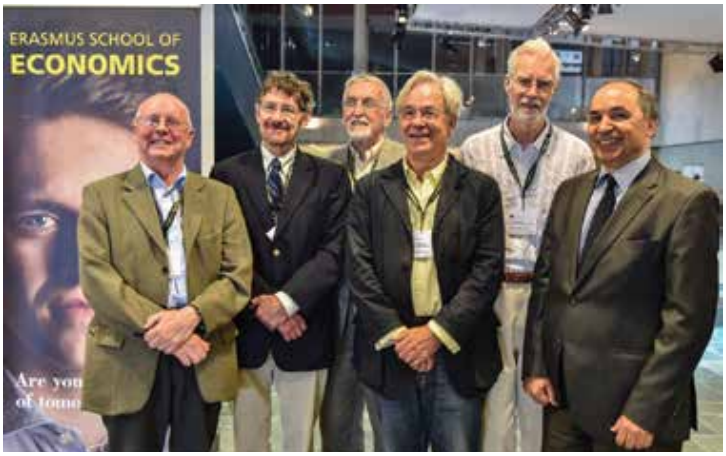
> Armstrong, J.S. & Collopy, F. (1996). Competitor Orientation: Effects of Objectives and Information on Managerial Decisions and Profitability, *Journal of Marketing Research*, 23, 188-199.

In second place, again by Scott's own measure, is

> Armstrong, J.S. (1977). Social Irresponsibility in Management, Journal of Business Research, 5(3), 185–213.

Reviewers' comments on these papers were highly negative. The journal editors published both over the objections of the reviewers. The first-place article includes data from experiments and historical data on the folly of focusing on market share as a strategic objective, and demonstrates that more than a third of decision makers favor harming competitors over increasing their own firm's profits. The second-place article includes laboratory experiments on executive committees' frequent willingness to physically harm (e.g., kill) customers when representing only stockholders in protecting sales and profits – and how to structure executive committees to reduce enacting such solutions (e.g., Iceland's national requirement for all corporations to include a minimum of three—not one or two—women on their board of directors).

These articles have garnered hundreds of citations in the years following their publication. Scott also mentioned to me that he wanted to leave as big a scientific legacy as he possibly could – a major focus of his life being contributing to accurate scientific knowledge. The Stanford Top 2% Scientists Report released in October 2023 identifies J. Scott Armstrong in the 99th percentile among all scientists. Scott fulfilled both of these objectives.



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