— IDENTIFYING RESEARCHERS "OF NOBEL CLASS"

In anticipation of the Nobel Prize announcements for 2016, which will begin on October 3rd this year, Web of Science™ is revealing its own list of laureates—our Citation Laureates.

Citation Laureates have been cited so often in the last two or more decades that these scientists typically rank in the top 0.1% by citations in their research areas. Not only do Citation Laureates have stratospheric citation totals, they also typically write multiple high-impact reports, and do so over many years.

CITATIONS AND PEER ESTEEM: A STRONG CORRELATION

Numerous studies in the past three decades have shown a strong correlation between citations in the literature and peer esteem, often reflected in professional awards, such as the Nobel Prize. Citations have been likened to repayments of intellectual debts, so persons who have accumulated such credits from their peers are often those whom these peers nominate for prizes and other honors.

Eugene Garfield, founder of the science citation database more than half a century ago—what is now known as the Web of Science, studied the correlation between high citation frequency and the receipt of prestigious prizes, especially the Nobel Prize. Based on his work, and those he mentored, Thomson Reuters analysts adhere to the following methodology in identifying the annual Citation Laureate selections.

1. **Look for highly cited research**—Consulting Thomson Reuters Web of Science, analysts review highly cited papers, total citation counts, citations-per-paper measures within field, and percentile scores during the last two, three or more decades, looking for the outliers that signal unusually influential work.

2. **Determine specific areas of research that citations recognize and discern whether authors cited were primary discoverers**—In science, priority is of the utmost importance. The analysts work to identify the authors chiefly responsible for a given discovery or advancement. Given the increasingly collaborative nature of research, confining the prospective winners to three advancement areas is a further challenge—one also faced by the Nobel committees.

3. **Explore the past history of awards for the potential nominees to see if the researchers were acknowledged for this work**—Certain prizes have attained renown as "predictor awards" for the Nobel Prize. In biomedicine, for example, two of the best known are the Canada Gairdner Award and the Lasker Awards. Thomson Reuters analysts review recognition the candidates have already received for the contribution under consideration.

4. **Consider whether the achievement might be recognized by the Nobel committee**—Discoveries that have resulted in significant benefit to humankind clearly invite Nobel recognition. History provides a venerable example in the 1945 Physiology or Medicine Prize to Alexander Fleming, Ernst B. Chain, and Howard Florey for the discovery of penicillin. Advancements that have opened up rapidly burgeoning areas of inquiry are also rewarded. One recent instance is the 2010 Physics prize to Andre Geim and Konstantin Novoselov for their work on isolating the nanomaterial graphene, prompting a worldwide surge in research on the material. Identifying such consequential work is another pointer to potential prizes.

5. **Look at recent Nobel prizes, judge topicality**—Attempting to anticipate what areas might be ripe for a Nobel Prize also plays into picking potential winners. In some instances, a Nobel might follow a given advancement in short order; graphene, again, provides an example, as the award followed the research by a comparatively short six years. In other instances, the lag time may be two or more decades. Analysis can weigh the areas or topics that have recently been acknowledged by a Nobel against those that seem "overdue."

As Harriet Zuckerman, the sociologist of science and author of a fundamental study on this subject, Scientific Elite: Nobel Laureates in the United States (New York: Free Press, 1977), has pointed out: "Every year, more scientists are eligible for Nobel Prizes than can win them." She continues:

"This means that there has always been an accumulation of 'uncrowned' laureates who are peers of the prize-winners in every sense except that of having the award."

Thus, in choosing our Citation Laureates, whom we forecast for Nobel Prize recognition in 2016 (or thereafter), we look first at high-impact papers, total citation counts, citations per paper relative to field averages, and other types of citation measures, but then also ask if the data reflects discoveries or

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themes that might be considered worthy of special recognition by the Nobel Committee.

In each of four areas—Physiology or Medicine, Physics, Chemistry, and Economics—we make three new choices. These individuals are in addition to the list of Citation Laureates we named previously who have yet to win the Nobel Prize but are still contenders according to our approach.

Since 2002, when Thomson Reuters began its annual exercise of recognizing Citation Laureates, 39 individuals have gone on to win the Nobel Prize. In terms of Nobel Prizes, rather than people, Thomson Reuters has correctly forecast 23 of 56 science Nobel Prizes awarded over the last 14 years.

A nominee remains a Nobel Prize contender in perpetuity. Even if not selected in the year in which he or she was nominated, his/her work is of such significance that the individual remains a candidate for the Nobel Prize into the future.

SUCCESSFUL CITATION LAUREATES PREDICTIONS FROM 2002–2015

Year	Nobel Prize Winner	Prize
2015	Angus S. Deaton	Economics
	Arthur B. McDonald	Physics
2014	Shuji Nakamura	Physics
	Jean Tirole	Economics
2013	Martin Karplus	Chemistry
	Eugene F. Fama	Economics
	Robert J. Shiller	Economics
	Peter W. Higgs	Physics
	François Englert	Physics
	Lars P. Hansen	Economics
	Randy Schekman	Medicine
	James E. Rothman	Medicine
2012	Shinya Yamanaka	Medicine
2011	Saul Perlmutter	Physics
	Adam G. Riess	Physics
	Brian P. Schmidt	Physics
	Ralph M. Steinman	Medicine
	Christopher A. Sims	Economics
	Dan Shechtman	Chemistry
	Thomas J. Sargent	Economics
	Jules A. Hoffmann	Medicine
	Bruce A. Beutler	Medicine
2010	Kostya Novoselov	Physics
	Andre K. Geim	Physics
2009	Elizabeth H. Blackburn	Medicine
	Carol W. Greider	Medicine
	Jack W. Szostak	Medicine
	Oliver E. Williamson	Economics
2008	Paul Krugman	Economics
	Roger Tsien	Chemistry
2007	Oliver Smithies	Medicine
	Mario R. Capecchi	Medicine
	Sir Martin Evans	Medicine
	Albert Fert	Physics
	Peter Grünberg	Physics
2005	Robert H. Grubbs	Chemistry
2003	Clive W.J. Granger	Economics
	Robert F. Engle	Economics
2002	Daniel Kahneman	Economics

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