TAKING CREDIT

Stewart Manley

A team of two brothers enters a baking contest. Their cake wins the first-place prize of £500. Will they demand £500 each? Of course not. Winners must split the prize. We often ignore this when we claim credit for team accomplishments. We take more credit than we deserve. I apply this idea to baking competitions and academic production but it applies equally to other arenas with teams of varying sizes.

Can 1 ever equal 2? When team credit is translated into individual credit, 1 can magically transform into 2. Or more. In this piece, I will show how we take more credit than we deserve. We do it because it is beneficial to us and (at least at first glance) not harmful to others. We tolerate it because it produces more rather than less of a good thing and because it encourages collaboration. Probably some of us are not aware of it. No authority dissuades us. It is, nonetheless, inaccurate and unfair. While the transformation begins as harmless imprecision of language, it evolves into something more pernicious.

Let's turn back to our baking brothers. They win £2000 in a second competition and split the winnings. The older brother, let's call him Russell, then enters a third competition but this time with his two sisters. They win the second-place prize of £300 and divide it by thirds. His bank account now contains £1350. With so much success, he decides to enter the next contest alone, winning the grand prize of £2000 (and now has £3350).

Russell's best friend asks, 'So, how much money have you won so far this year?' This might be a difficult question for Russell – he might be tempted to exaggerate by

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including his brother's and sisters' winnings – but because his bank account contains £3350, he will probably stick with that number. Russell is honest.

Then his other friend, who is sitting there with them, asks Russell a more difficult question, 'That's great! So how many cakes have you baked this year?' Russell has entered four competitions, but really, how many cakes has he baked? If we count the cakes like we count his winnings, he baked 2.33 cakes ($\frac{1}{2} + \frac{1}{2} + \frac{1}{3} + 1$). To make things more interesting, let's say as well that when he teamed up with his sisters, he let them do most of the baking. In fact, he just gave them a couple of pointers and poured the milk into the mixing bowl. Should Russell consider discounting the amount of cake he baked with his sisters? What should he say? Of course, he will simply answer, 'Four'.

We do not consider Russell's response dishonest, especially if we know that three of his cakes were team-baked. It would be unreasonable to expect him to make complicated calculations to a seemingly straightforward question. And who bakes 2.33 cakes? Moreover, his answer does not take credit from his teammates – they also can take full credit for the cakes if they wish. No harm, no foul. We let him go on this one.

Near the end of the year, the mayor of Russell's town announces that a prize will be awarded to the person who has baked the most competition cakes (some competitions allow more than one entry). Russell gulps. He feels guilty about his effort on his sisters' cake. The mayor then announces a special plaque to be hung in the town hall for the baker with the most winnings. Russell gulps again. He submits his numbers: 'Four cakes. £4800.' We cannot let him get away with this one.

In academia, we bake lots of cakes. We call them articles and books. Our prizes are the references others make to our work. We call these citations. There are many rewards – promotion, tenure, increased reputation, in some places even cash bonuses – for those with the most cakes and the most citations. Sometimes we bake alone; sometimes with

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colleagues. Sometimes our colleagues help a lot; sometimes, like Russell, they don't. When we co-author, we don't count one article or citation as two. Instead, we count one article or citation as one for each of us. This is a mistake. Like Russell, we are inflating the value of our co-authored work.[1]

A good (but not the only) example of the impact of this miscalculation is in our h-indices. The h-index is a key number in determining a researcher's individual productivity and impact. A researcher – let's call her Monica – has an h-index of 3 if she has three publications each of which has received at least three citations. If Monica adds a fourth publication but it only has one citation to it, her h-index remains 3, but once her four publications each receives at least four citations, her h-index rises to 4. The higher the h-index, presumably the more productive and impactful a researcher is. The h-index considers each citation to an article as one citation, however, without discounting for co-authorship. Herein lies the problem.

At the same time as Monica is publishing, three more of her colleagues do the same thing as her, each producing four articles with four citations. She and her colleagues combined have produced 16 articles that have received 64 citations. Each has an h-index of 4. Then, four different colleagues team up to co-author four articles that generate four citations each. They produce four articles that receive 16 citations. They will also each have an h-index of 4. This is manifestly unfair. Sixteen articles and 64 citations $\neq$ 4 articles and 16 citations. Measured quantitatively, we cannot say that the co-authoring colleagues are as productive and impactful as the single-authoring ones.

The only way to cure the problem is to divide the cake (including prizes) among its bakers. One article is one article and one citation is one citation. The credit for them must be divided among their authors. The authors (who know best how much everyone contributed) should do the dividing. This is not easy and gives us more to do. But it is honest. Until we do it, single authors and smaller teams

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are being unfairly short-changed. I see no way around this and it should apply to all academic fields.

Over-attributing credit is applicable (and potentially problematic) to any arena where individuals compete with teams or where teams vary in size. When a team has a fixed number of members, as in doubles tennis, members will always receive equal credit for a win or a trophy. Everyone knows that a doubles team always has two members. If both members take credit for the win (in their stats, they both list it as '1 win'), no one bats an eye because we know it was a joint win by two. There's no problem here. The more the variation, the more the potential for uneven credit. Premier League football teams send 11 players to the field and have up to 14 more on the bench. The champions one year might have 25 players while the following year's champion could have 23. If they all claim the win (which they surely will), an overly technical fan might raise an eyebrow but because the active members at any given time – 11 – is always the same, we tend to ignore it. Each member can claim credit because everyone knows they won it as a team and the variation in team size has a negligible effect, if any, on the win.

In contrast, consider how much a legal team can vary in size. Many lawyers are sole practitioners; Clarence Darrow defended John Scopes and the teaching of evolution on a team of five (two resigned when the trial began); O. J. Simpson was represented by the twelve-member 'Dream Team' (with surely many more behind the scenes). If there was a place on their CVs for 'number of cases won', all would take full credit. '1 win'. When one of Simpson's team wins his (they were all men) next case, this time with only one other co-counsel, he will again take credit for '1 win'. Looking at his CV, one might see – just hypothetically – '327 wins'. Like Russell and many academicians, he is taking too much credit. Unlike people rating the football players, we do not know how to judge the value of his wins because his team size had too much potential variation and his CV does not provide enough information for us to calculate roughly

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the actual credit he deserves. A sole practitioner also with 327 wins (regardless of whether they are as high-profile as Simpson's) is short-changed. A member of the Dream Team would not fudge on the amount of attorney's fees collected; he should also not misrepresent his amount of victories.

The taking of too much credit is not a big deal if it has no consequences: '327 wins' may not mean much on a CV or on a website profile page. We shrug it off. But once it becomes significant, such as in determining a prize, deciding between job candidates, or ranking the nation's top lawyers, the exaggeration becomes objectionable.

Scholars who co-author (and Simpson's lawyers) may not be pleased to hear that their cakes and prizes are worth less than they thought. In the remainder of this piece, I address some of their possible objections. In full disclosure, all of my articles are single-authored.

One objection is that co-authored articles deserve more credit because they are better and took more effort. This might be true sometimes – maybe even many times – but is not necessarily so. Often, collaboration leads to a better product. Sometimes research teams invest immense resources and effort into producing a single, revolutionary paper. But there are also mediocre and even poor papers with many authors. Sometimes single-authored papers are stellar (just look at Einstein's). You would surely not determine the winning cake based on the number of bakers. Similarly, an editor of a journal would never consider the number of authors in deciding whether to accept an article for publishing. And even if it were true that more authors ensured a better piece, quality must be separated from quantity. One excellent article is one excellent article (its excellence should attract more citations) and one citation is one citation. They cannot be counted twice. (A reader might also discern how judging scholars on quantity rather than quality is itself a grave mistake.)

Another objection is that a jointly authored paper and the citations to it are the product of many, and each deserves full credit. Russell cuts the nuts and cherries, sifts the flour,

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and beats the eggs. His younger brother – let's call him Mark – works on the frosting. Together, they build a beautiful and delicious cake. A judge tastes. 'Yum', she says. 'This frosting, oh my. The flavour is marvellous and the combination of colours is sublime.' The camera pans to Mark's face. 'Thank you very much', he says, blushing slightly. 'Oooooo, and this combination of nuts and cherries is so perfect!' says another judge. 'Merci', says Russell, beaming (the competition is in France). The brothers received two compliments, one for Russell's work and one for Mark's. They cannot both take credit for both compliments. The last judge says, 'Overall, this is just superb!' Russell and Mark will need to split that one. If Russell and Mark each want credit for baking an entire cake, then they need to bake two cakes. If they want to enjoy the compliments for themselves, they need to bake their own cakes.

Another objection is that in some fields, multiple authors are the norm, especially where by necessity work is done in teams (experimental physics comes to mind). Dividing their papers and citations would be unfair. A 2015 physics paper about the size of the Higgs boson remarkably has 5,154 authors – it is 33 pages long with 24 of those pages listing the authors and their institutions (the article has received 544 citations). You try to measure a boson on your own. If these scientists continue to co-author more papers together, they will have to publish 5,154 articles to reach one article each. There is nothing unfair about this. It took 5,154 people to produce this one article. It is ground-breaking. They should be rewarded for their hard work. But combined they should not receive credit for more than one paper and 544 citations.

We can normalize the quantity of articles and citations to account for field-based differences. By normalize I mean requiring less (or more) articles and citations by field for whatever purpose we are measuring. For instance, a promotion committee could require only two articles from an experimental physicist while requiring three from a philosopher (philosophers are more likely to publish alone). Normalizing by field is already done when comparing

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journal impact factor (the average number of citations received in the current year by articles published during the previous two years). We recognize that natural science journals, as an example, have a higher impact factor on average than those in the social sciences largely due to different citation and publication practices. In measuring performance and for promotion, my university recognizes that on average those in the natural sciences and medicine publish more articles than researchers in the social sciences or arts and humanities, again due to differences in the nature of their fields. There is nothing wrong with this normalizing and it can be done to make it fair for researchers in certain fields once their articles and citations begin to receive the proper reduced credit. Normalizing makes things fair between fields; calculating credit accurately makes things fair for researchers within the same field.

Another objection is that dividing the cake will discourage collaboration. A collaborative-minded author, the argument may go, will have to be involved in more projects than a single author to get the same credit. This is true, but there is nothing wrong with it. Joint effort should be able to produce more (or at least better) work; if not, there is little point in collaborating. Any author, collaborating or not, must determine how many articles can legitimately be produced from work. Producing too few articles fails to utilize effort fully; producing too many risks rejection from discerning editors who view the pieces as too slim. Collaborative authors, just like authors who write alone, must find a way to maximize the quantity of their output without providing too little meat in each sandwich. More importantly, the aim of collaboration should not be to produce as many articles as possible using the least effort, but rather to do interesting, good work. Cutting the cake will rightfully discourage collaboration from those scholars who are more interested in the former. Optimal collaboration, not any collaboration, should be encouraged.

A final objection is that cutting the cake and its prizes will lead to squabbling (and sometimes worse) over how to divide them. It is not easy to determine how much credit a supervisor who provides the initial concept or high-level

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feedback deserves. It is also not easy to know before the work begins how much everyone will contribute, which means the final division would probably often take place near the article submission stage. This could lead to tense discussions. A simple solution would be by default to divide equally with the burden on someone who disagrees with equality to convince the others. A team leader could help resolve any disputes. Or dividing the credit could be delegated to the leader. The challenges that accurate division poses are not insurmountable and should not prevent us from correctly giving credit. Ombudspeople or faculty committees could help protect junior researchers from being taken advantage of.

On the bright side, there are benefits to dividing the cake that go beyond being fair and counting accurately. Dividing credit for the cake and its prizes will discourage authorship hanky-panky (like 'gift authorship' – adding an author as a favour, such as someone who needs a publication for promotion, or 'honorary authorship' – adding a senior or prominent person to curry favour or increase the article's chance of acceptance). No longer will researchers load others (sometimes with no expertise in the field) into the author line. After all, the more names there are, the less credit each will get, creating a strong incentive to make sure that everyone contributes. There would also be a greater drive to contribute as much as possible, knowing that your co-authors are working hard and may claim a greater share of the cake. The incentive for the (sadly) familiar 'Hey, you put me on yours and I'll put you on mine' would disappear. There would be less collaboration for the mere sake of collaboration. Most researchers of course do not engage in these shenanigans, but until authorship and citation counting is done properly, there will remain an incentive to increase the number of authors that some find irresistible.

Some efforts have been made to ameliorate the miscounting of scholarship but they have limited impact. Universities value author contributions differently depending on the position of an author's name in the author list. For some fields,

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the first-named author (often the one who did the most work) is given the most credit, the last author (often the supervisor or team leader) the second-most credit, and the others equal credit. But sometimes the names are in decreasing order of contribution and sometimes they are listed alphabetically. It depends largely on the custom of the field. Nevertheless, these conventions fail to measure accurately the total credit, which should always add up to 1. A number of journals encourage author contribution statements that specify the nature of each author's contribution (e.g. writing, supervision, or development of methodology). These are useful but similarly fail to address the mismeasurement of contribution. Neither contribution statements nor authorship order mitigate the mismeasurement of credit for citations. Neither can replace cutting the cake.

Miscalculating credit tips the scales towards the teams of bakers – the more members, the more credit. Academia should encourage collaboration without exaggerating its credit. We would not tolerate Russell claiming that he won £4800 and baked four cakes. Yet we tolerate academicians claiming full credit for each output when it is not their own; or at least not fully their own. Just look at the colourful publication charts on the profiles in my university's directory (https://umexpert.um.edu.my/). This reminds me, it is not the academicians who misclaim it, but our defective systems of measurement. These need to be fixed. Otherwise, our cakes will be full of hot air and our prize money – at least some of it – counterfeit.

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Note

[1] I am not the first to propose that credit for authorship be divided. See, for example, T. Prabhakar Clement, 'Authorship

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Matrix: A Rational Approach to Quantify Individual Contributions and Responsibilities in Multi-Author Scientific Articles', *Science and Engineering Ethics* 20(2) (2014): 345–61.

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