

## Forum

# Who Might Get the Nobel Prize for Cosmic Inflation?

Philip E. Gibbs\*

### Abstract

So who do you think would be the right recipients for any Nobel Prize that might be awarded for inflation assuming the BICEP2 results hold up? In my opinion, the destination of the theory component of the prize is not yet determined even if the experimental discovery is confirmed and will depend on work that is still to come. Otherwise, I would expect it to go to Guth, Linde and Starobinsky as indicated by the poll I have been conducting.

**Key Words:** Nobel Prize, BICEP2, B-modes, cosmic inflation, Big Bang, gravitational waves.

We now have the results of BICEP2 and within a few more weeks that could be confirmed in more detail by Planck. If this happens the observational status of the theory of cosmic inflation will change dramatically because primordial gravitational waves have been described as a smoking gun for the theory. Well that may be an exaggeration but the observed scale invariance of the CMB anisotropy spectrum is already a good pointer towards inflation so could the combination be enough to sway the notoriously cautious Nobel committee towards awarding a prize for the theory?

Guth and Linde have already been jointly awarded several honours for their work on inflation theory including the Gruber Prize and Milner's Fundamental Physics Prize, but the Swedish committee places a higher bar for empirical verification. The general idea of the inflationary universe may pass with the new evidence giving Guth his ticket, but Linde has worked on more specific models of inflation such as slow-roll and chaotic inflation. Brilliant and important though his work is, I am not convinced that he is destined for the Nobel yet. Argue with me if you disagree.

On closer analysis, Linde's model of chaotic inflation with quadratic potential appears to be in particularly good shape. In any case, his widely seen status as one of the "principle architects of inflation theory" along with Guth is sure to win him many nominations.

On the other hand Guth is not the only one with a claim to the original idea of inflation. It has been recorded that he first had the breakthrough idea on 6th December 1979, gave a seminar on the theory at SLAC on 23rd January 1980 and his paper was received on 11th August 1980. At around the same time, Katsuhiko Sato in Japan had written a paper proposing inflation by 21st February 1980 which was received for publication on 9th September 1980, and another similar paper by Demosthenes Kazanas had already been received by 5th May 1980.

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Note: This essay is based on <http://blog.vixra.org/2014/03/16/who-should-get-the-nobel-prize-for-cosmic-inflation/> and <http://blog.vixra.org/2014/03/20/vote-for-inflation-nobel-prize/>

All three contributions seem to have been independent and similar. The only thing that may have singled out the work of Guth was that his term “inflation” stuck and he was part of a more influential circuit of physicists. Closer examination of dates and the points they made in their papers may separate them, but I think it would be hard to be truly objective about what really counts.

But then all three were preempted by Soviet physicist Alexei Starobinsky who had already worked out the ideas behind inflation in 1979. Wikipedia describes his contribution like this:

Although Alexei Starobinsky of the L.D. Landau Institute of Theoretical Physics in Moscow developed the first realistic inflation theory in 1979 he failed to articulate its relevance to modern cosmological problems. Due to political difficulties in the former Soviet Union, regarding the free exchange of scientific knowledge, most scientists outside the USSR remained ignorant about Starobinsky’s work until years later. Starobinsky’s model was relatively complicated, however, and said little about how the inflation process could start.

I think this is an overly negative view of his contribution and I suspect that it owes more to a bias that tries to rationalize the fact that we do not recognize his work as well as we recognize Guth’s. It is notable that he had already predicted the primordial gravitational waves in 1979 before anyone else had even started thinking about inflation. How the Nobel committee will see it I can only guess. Starobinsky did also win the Gruber prize independently of the prize given earlier to Guth and Linde. He was recognised along with Viatcheslav Mukhanov who, in collaboration with Chibisov (deceased), first calculated the spectrum of anisotropies from quantum fluctuations during inflation and who could therefore be yet another candidate for the Nobel. Once again the Nobel committee will again be inflicted with the headache that strikes them when more than three people deserve their recognition for the same discovery.

The following is a list of scientists who might be worthy of Nobel Prize for Cosmic Inflation:

Andreas Albrecht  
Demosthenes Kazanas  
Jamie Bock  
Eva Silverstein  
Alexei Starobinsky  
Brian Keating  
Uros Seljak  
Andrei Linde  
John Kovac  
Chao-Lin Kuo  
Martin Einhorn  
Paul Steinhardt  
Alan Guth  
Clem Pryke  
Katsuhiko Sato  
Viatcheslav Mukhanov

Renata Kallosh  
Stephen Hawking

The Guardian has now [also discussed](#) the same question and made the point that the Nobel committee will have a hard choice, but you will see that they have not identified all the candidates that we have here. Some people have responded by saying that we [should not be thinking](#) instantly about who should win a Nobel yet because it is too soon. I disagree with that.

The story about who are the main people behind this discovery is of immediate interest and by focusing on the possibility of Nobel prizes I think we highlight the human side of the discovery. It is true that we should be cautious about [the uncertainty of the discovery](#) until it has been confirmed but that does not stop us talking about the consequences, either scientifically or sociologically. There is a danger of being too negative and missing the opportunity to make some science and worthy scientists known to the wider public while their gaze falls fleetingly on upon physics and cosmology.

I have been conducting a poll on who do you think would be the right recipients for any Nobel Prize. What do the poll results say? The first thing that stands out is that the theorists are getting the most votes, especially Linde, Guth, and Starobinsky. Linde has now rushed ahead of Guth because he suddenly got 50 extra votes. The theoretical bias is perhaps understandable because the media ([including me](#)) has said more about the theorists and they have been familiar to us for many years. Indeed Guth and Linde in particular have been tipped for the Nobel long before this discovery.

The experimenters are new stars so they have a smaller fan club and get less votes, but the Nobel Committee may see it the other way round. If BICEP2 is confirmed by Planck then it will be clear that a Nobel worthy discovery has been made even if the theory behind it remains uncertain. When the prize was given for accelerating cosmic expansion the committee made it clear that the award was for the observation irrespective of how theorists interpreted it and they are likely to see this discovery the same way until it is clear that inflation is the correct explanation rather than the alternatives.

The Nobel committee could in fact play things in several different ways:

1. A prize for the experimental side first followed by the theory prize later
2. A prize for the theory side first followed by the experiment
3. A combined prize for both
4. A prize just for the theory
5. A prize just for the experiment
6. No prize at all.

I predict option 1 assuming confirmation, but any of the others are quite possible. Choosing the experimental prize is already difficult. There is an [interesting story](#) about how it was caltech postdoc Brian Keating who originated the idea for this experiment and then persuaded Jamie Bock to take it on. This would suggest that Keating and Bock are key candidates for the prize but Keating seems to have dropped out of the picture at some point so he does not get many votes.

John Kovac has been promoted as the main leader of the experiment but [Chao-Lin Kuo](#) led the team that really made the instrument work and Clem Pryke's team made crucial discoveries for the analysis. I find it painful to think that at least one of these people will have to be left out but that is the way the Nobel works. If I am forced to make a prediction at this stage I would go with the voting so far and say it will be Kovac and Bock who take the honour on behalf of the BICEP2 team while Uros Seljak would make a fitting third laureate for his seminal work on B-modes that made the experiment possible.

On the theory side that I already covered there are three classes of theoretical work on inflation that could eventually be rewarded. There is the initial realisation that inflation may be a feature of cosmology and could solve certain problems (flatness, horizon, monopole etc) Guth, Starobinsky, Kazanas and Sato are independently responsible for this idea. Then there are the people who made crucial predictions of gravitational waves and anisotropies in the microwave background. The ones who got there first are Starobinsky, Einhorn and Mukhanov. The committee favours such predictions for obvious good reasons so any of these people could be up for the prize.

Finally we have those who have worked on specific models including Linde, Albrecht and Steinhardt. The problem for these people is that no particular model for inflation has been shown to work yet. It is possible that that work has not yet been completed or that a more recent specific model will be shown to be right. However, Linde is such a big figure in the field of inflationary cosmology who has been tipped for the Nobel for years already that I think the weight of nominations will be in his favour and if that is the case then he is surely deserving enough. In my opinion, the destination of the theory component of the prize is not yet determined even if the experimental discovery is confirmed and will depend on work that is still to come. Otherwise, I would expect it to go to Guth, Linde and Starobinsky as indicated by the poll I have been conducting.

## Reference

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