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September 25, 2006

Dear Mr. Cooper

I am very disturbed by the unfair manner in which Yau Shing-Tung has been portrayed in the New Yorker article. I am providing my thoughts below to set the record straight. I authorize you to share this letter with the New Yorker and the public if that will be helpful to Yau.

As soon as my first paper on the Ricci Flow on three dimensional manifolds with positive Ricci curvature was complete in the early '80's,Yau immediately recognized it's importance;and although I had proved a result on which he had been working with minimal surfaces,rather than exhibit any jealosy he became my strongest supporter.He pointed out to me way back then that the Ricci Flow would form the neck pinch singularities,undoing the connected sum decomposition,and that this could lead to a proof of the Poincare conjecture.In 1985 he brought me to UC San Diego together with Rick Schoen and Gerhard Huisken,and we had a very exciting and productive group in Geometric Analysis.Huisken was working on the Mean Curvature Flow for hypersurfaces,which closely parallels the Ricci Flow,being the most natural flows for intrinsic and extrinsic curvature respectively.Yau repeatedly urged us to study the blow-up of singularities in these parabolic equations using techniques parallel to those developed for elliptic equations like the minimal surface equation,on which Yau and Rick are experts.Without Yau's guidance and support at this early stage,there would have been no Ricci Flow program for Perelman to finish.

Yau also had some outstanding students at San Diego who had come with him from Princeton, in particular Cao Huai-Dong,Ben Chow and Shi Wan-Xiong. Yau encouraged them to work on the Ricci Flow,and all made very

important contributions to the field.Cao proved existence for all time for the normalized Ricci Flow in the canonical Kaehler case ,and convergence for zero or negative Chern class.Cao's results form the basis for Perelman's exciting work on the Kaehler Ricci Flow,where he shows for positive Chern class that the diameter and scalar curvature are bounded. Ben Chow,in addition to excellent work on other flows,extended my work on the Ricci Flow on the two dimensional sphere to the case of curvature of varying sign.Shi Wan-Xiong pioneered the study of the Ricci Flow on complete noncompact manifolds,and in addition to many beautiful arguments he proved the local derivative estimates for the Ricci Flow.The blow-up of singularities usually produces noncompact solutions,and the proof of convergence to the blow-up limit always depends on Shi's derivative estimates; so Shi's work is central to all the limit arguments Perelman and I use.

In '82 Yau and Peter Li wrote an exceedingly important paper giving a pointwise differential inequality for linear heat equations which can be integrated along curves to give classic Harnack inequalities. Yau repeatedly urged me to study this paper,and based on their approach I was able to prove Harnack inequalities for the Ricci Flow and for the Mean Curvature Flow. This Harnack inequality,generalized from Li-Yau,forms the basis for the analysis of ancient solutions which I started, and which Perelman completed and uses as the basic tool in his canonical neighborhood theorem. Cao Huai-Dong proved the Harnack estimate for the Ricci Flow in the Kahler case,and Ben Chow did the same for the Yamabe Flow and the Gauss Curvature Flow.

But there is more to this story. Perelman's most important is his noncollapsing result for Ricci Flow,valid in all dimensions,not just three,and thus one whose importance for the future extends well beyond the Poincare conjecture,where it is the tool for ruling out cigars,the one part of the singularity classification I could not do. This result has two proofs,one using an entropy for a backward scalar heat equation,and one using a path integral.The entropy estimate comes from integrating a Li-Yau type differential Harnack inequality for the adjoint heat equation,and the other is the optimal Li-Yau path integral for the same Harnack inequality; as Perelman acknowledges in 7.4 of his first paper,where he writes "an even closer reference is [L-Y],where they use "length" associated to a linear parabolic equation,which is pretty

much the same as in our case".

Over the years Yau has consistently supported the Ricci Flow and the whole field of Geometric Flows,which has other important successes as well,such as the recent proof of the Penrose Conjecture by Huisken and Ilmanen,a very important result in General Relativity. I cannot think of any other prominent leader who gave nearly support to our field as Yau has.

Yau has built is an assembly of talent,not an empire of power,people attracted by his energy,his brilliant ideas,and his unflagging support for first rate mathematics, people whom Yau has brought together to work on the hardest problems.Yau and I have spent innumerable hours over many years working together on the Ricci Flow and other problems,often even late at night. He has always generously shared his suggestions with me,starting with the observation of neck pinches,never asking for credit. In fact just last winter when I finally managed to prove a local version of the Harnack inequality for the Ricci Flow,a problem we had worked on together for many years,and I said I ought to add his name to the paper,he modestly declined.It is unfortunate that his character has been so badly misrepresented.He has never to my knowledge proposed any percentages of credit,nor that Perelman should share credit for the Poincare conjecture with anyone but me; which is reasonable,as indeed no one has been more generous in crediting my work than Perelman himself.Far from stealing credit for Perelman's accomplishment,he has praised Perelman's work and joined me in supporting him for the Fields Medal.And indeed no one is more responsible than Yau for creating the program on Ricci Flow which Perelman used to win this prize.

Sincerely yours,
Richard S Hamilton
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