

Referee's Report on "Nonuniqueness and stability of the configuration of flow of immiscible fluids with different viscosities" by D.D. Joseph, K. Nguyen & G.S. Beavers

and

"Instability of the flow of immiscible liquids with different viscosities in a pipe" by D.D. Joseph, M. Renardy & Y. Renardy

These papers deal with the subject of flow of immiscible fluids with different viscosity. The first paper is a stimulating review of the various experimental phenomena which can be observed in the laboratory. Few quantitative measurements are made and there appear to be problems with the reproducibility of the experimental results. Interfacial phenomena are notorious for their sensitivity to small impurities or chemical reactants. Perhaps a chemical engineer could provide detailed comments and interpretations of some aspects of the observations. In spite of the lack of quantitative results, the paper is valuable and the striking photographs are likely to stimulate further research in this area of fluid mechanics.

The second paper is less satisfactory. It has been written as an engineering report with a large number of tables and graphs. The numerical data will hardly be of interest to the reader of the Journal of Fluid Mechanics. A few graphs for growth rates of the most unstable mode as a function of the parameters of the problem should be sufficient. The results for stability of pipe flow with a more viscous inner component are of interest since no previous computations of this case seem to have been carried out and since it is of obvious practical importance. The discussion of the dissipation principle could be made more accessible to readers of the Journal if cast in less formal mathematical language.

Both papers contain new results, but the second paper can be recommended for publication only after a major revision. The first paper could benefit from a more concise style of writing.

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Referee's Report on "Instability of the flow of immiscible liquids with different viscosities in a pipe," by D. D. Joseph, M. Renardy, and Y. Renardy

This is a technical report, with complete details of all calculations. I cannot believe it was submitted in its present form to JFM. It has too much detail, the objectives are not clear, and the writing is confusing. There are a great many, very-detailed tables - far more than are warranted by the subject. I suggest the authors decide on the most important objectives and submit a tightly written, clear manuscript. There is nothing wrong with the subject or the treatment of it.

Review of: "Instability of the flow of immiscible liquids with different viscosities in a pipe." By D.D. Joseph, M. Renardy and Y. Renardy

Excluding the second section, which seems to bear little relationship to the rest of the paper, this work represents a straightforward linear instability theory of two-phase ("bi component") flow in a pipe. Non-axisymmetric modes are treated as well as axisymmetric ones. The assumptions of zero surface tension and equal densities greatly simplifies the analysis at the expense of loss of important physical effects. The remaining parameters are viscosity ratio, radius ratio, and Re. The paper consists of a tedious discussion of accuracy of solutions of the resulting eigenvalue problem accompanied by 11 tables (curiously called "Figures") of numerical results and an equally tedious discussion of some 26 figures (called "Graphs") of results.

Trimmed of this bulk, the paper has really very little to say (that I could discern) over and above the result that the flow is more stable when the less viscous fluid is in the region of highest shear and that stability depends upon radius ratio.

It is clear to me that the authors have not made a serious attempt to communicate these results in a concise fashion, and the paper should be rejected.



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August 2, 1983

Professor John W. Miles
Associate Editor, Journal of Fluid Mechanics
Institute of Geophysics and Planetary Physics, A-025
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, California 92093

Dear John:

We are enclosing a revised version of the paper "Nonuniqueness and stability of the configuration of flow of immiscible fluids with different viscosities", by Joseph, Nguyen and Beavers, which we recently submitted for publication in the Journal of Fluid Mechanics. We appreciate the referees' comments about this paper, and we have made our revisions to accommodate all their suggestions. Specifically we have attempted to satisfy the referees with the following changes:

Referee A suggested a condensation and better organization, which we have accomplished in the following way:

- (i) The original Sections 9 and 13 have been condensed and incorporated into the Introduction (Items 2 and 3).
- (ii) The original Sections 3-8 have been substantially reduced and are now presented as a single Section 3 (Item 1).
- (iii) The original Sections 10-12, which we believe are essential to the development of the work, have been reorganized into a single Section 4 (Item 4).
- (iv) The original Sections 14-17, which Referee A suggests should be published as is, have been organized into a single Section 5 with no change in content (Item 5).


Referee C suggested that the paper "could benefit from a more concise style of writing", and we hope that our revisions have satisfied that suggestion.

Referee B recommended that the paper be published as is. We trust that the revised format will be acceptable.

We hope that the revised version is now acceptable for publication and have enclosed the original line drawings of the figures, and the original color photographs. We would like JFM to return the original photographs after the paper has been published, because most of them are color Polaroid prints.

The Renardy's and I are preparing a revised version of our paper "Instability of the flow of immiscible liquids with different viscosities in a pipe". I hope to be able to send the revised version to you within a few weeks.

Yours sincerely,


Daniel D. Joseph

DDJ:lw

Enclosures



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August 5, 1983

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Physics, A-025
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La Jolla, CA 92093

Dear John,

We are enclosing a revised version of the paper "Instability of the flow of two immiscible liquids with different viscosities in a pipe" by Joseph, Renardy and Renardy which we recently submitted for publication in the Journal of Fluid Mechanics. The paper has been revised along the lines suggested by the referees. We have omitted many details of computations and results which can in any event be found in our MRC report listed in the references. As a consequence, the paper has been reduced to less than one half of its former size. I believe that the paper is now concisely and efficiently written.

Referees B and C seem to favor publication of the results of our paper but they want us to communicate our results in a more efficient fashion. In addition, referee C thinks that the dissipation principle could be made accessible to readers of the Journal if case in less mathematical language. We think our revised version should satisfy referees B and C.

Referee A

"Trimmed of this bulk, the paper has very little to say (that I could discern) over and above the result that flow is more stable when the less viscous fluid is in the region of highest shear and that stability depends on radius ratio.

It is clear to me that the authors have not made a serious attempt to communicate these results in a concise fashion, and the paper should be rejected."

We hope that we have now communicated the results mentioned by A in a concise fashion. Besides these results, which are well liked by C, there are the variational results which

Professor John W. Miles
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are clearly identified by B.

See how the Fates their gifts alot
For A is happy - B is not
Yet B is worthy, I daresay
Of more prosperity than A.

Best regards,

Dan

DDJ:sh

The authors remind me of developers whose first proposals are for projects which are outlandishly huge. Any reduction to simply "way too large" is considered a concession and the project is approved. This manuscript is that way. It started with 17 chapters and is down to some 40+ pages, 20 photos and 13 figures! Section 3 is still trivial and well-known, and Section 4 is still unnecessary: the only ideas in it which are "essential to the development of the work" may be simply stated in a few lines. My original review suggested that these be eliminated, not condensed, and I stand by that opinion.

788-789-C

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78-1-1

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