Letter from the Editors:

This is the third volume of the IUSB Undergraduate Research Journal. Over the past three years, we have seen the journal grow and mature into a true representation of the diverse research accomplished on the IUSB campus. There are a few changes to this volume, but the overriding concept remains the same: To promote research among undergraduate students at Indiana University South Bend and provide them with the opportunity and experience of publication.

In order to stay true to the journal’s inclusive purpose, this volume does not have a subtitle or theme. Another change is the smaller font and tighter line spacing which we use for the sake of increasing the number of published papers. This marks the first year the journal was forced to turn away as many submissions as were chosen for publication. We confidently predict the near future will hold an increased page count to accommodate the high number of quality submissions. We are grateful to the students and faculty who enthusiastically support participation in research and our journal.

Students, with the help and support of IUSB faculty, produced the Undergraduate Research Journal. We wish to acknowledge and thank those people who have contributed more than we could possibly repay:

All of the authors who submitted papers, revised their papers and suffered the trauma of the publication process. The communicating faculty, who’s dedication to undergraduate research makes this journal possible. The Publications Board for their whole-hearted support. The entire troop of student referees and copy editors. Kim Muske for finding many of them. Theresa Drust for noticing what no one else did. Jeff Bradberry, because he knows where the web page is. Chris Hughes for his awesome cover design. Amy Roberts for her late night wrestling matches with LaTeX. Dr. Monika Lynker for her technical expertise and problem solving skills. The shoulder of Dr. Roy Schreiber, and his political skills, too. Dr. Steve Shore for being an inspiration. Debbie Richards for knowing which way was up, when we didn’t. Amy Selner, who never once yelled despite our abuse. The Physics Reading Room, for its comfy couch, good company and 24 hour schedule. And most of all, the faculty and students whose continued participation in research ensures the continued growth of IUSB and the journal.

We are proud to present a mere 19 examples of the many and diverse research projects undertaken by students with the support of faculty at this university. It is our hope that future volumes will be able to accommodate an even larger sample of the excellent work being done on our campus.

Thank you,

Teri L. Anderson
Christina Lett
You’ve gotta start early if you’re gonna stick it out, Firesign Theater, We’re All Bozos on this Bus

To the reader:

You are about to enter a diverse and fascinating world. The Undergraduate Research Journal of Indiana University South Bend is a special production. It has been conceived, guided, and produced entirely by students as their homage to a newfound love, research. As academics and as thinking people, can we not be curious? What singular delight there is in posing a new question and seeing where it leads! What is the purpose of a university, after all, if not to produce in the individual a sense of personal connection with the universe of ideas and to foster scholarship, deep and exacting and often lonely, as a lifetime habit.

There is, however, another side to the activity of research. With discovery and insight comes publication. Since the founding of journals in the seventeenth century as a means of disseminating scholarly work, publication has been essential to intellectual life. It makes others aware of your work, thereby enriching the store of ideas from which new work can arise. It links minds through both space and time. Once divorced from its creator, a publication has a life of its own and as such instantly transforms from personal to communal property. It is far more than simply the author marking intellectual territory for self-advancement. Entered into openly, publication expresses a belief in your responsibility to the advancement of learning. There is also an element of personal risk here. Publication exposes the research to scrutiny as well as extension. But this is perhaps, I think, its greatest importance. Ideally, external criticism serves to refine your thought, perhaps detecting flaws which you, as the originator of the work, have been blind to or revealing possibilities of which you were unaware.

To those whose work is contained here, my congratulations. To those who are about to read these works, I hope you will find them enlightening, stimulating, puzzling, and engaging. Both authors and readers are joined by these acts in the community of scholars. Now go shake up the world.

Dr. Steven Shore
Prof. of Physics and Astronomy
IUSB
Scientific Editor, Astrophysical Journal