About This Journal

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EXPERIMENT has always been, and increasingly is, an important method of mathematical discovery. (Gauss declared that his way of arriving at mathematical truths was "through systematic experimentation".) Yet this tends to be concealed by the tradition of presenting only elegant, well-rounded and rigorous results.

While we value the theorem-proof method of exposition, and while we do not depart from the established view that a result can only become part of mathematical knowledge once it is supported by a logical proof, we consider it anomalous that an important component of the process of mathematical creation is hidden from public discussion. It is to our loss that most of us in the mathematical community are almost always unaware of how new results have been discovered. It is especially deplorable that this knowledge is not made part of the training of graduate students, who are left to find their own way through the wilderness.

Experimental Mathematics was founded in the belief that theory and experiment feed on each other, and that the mathematical community stands to benefit from a more complete exposure to the experimental process. The early sharing of insights increases the possibility that they will lead to theorems: an interesting conjecture is often formulated by a researcher who lacks the techniques to formalize a proof, while those who have the techniques at their fingertips have been looking elsewhere. Even when the person who had the initial insight goes on to find a proof, a discussion of the heuristic process can be of help, or at least of interest, to other researchers. There is value not only in the discovery itself, but also in the road that leads to it.

The essential ingredients of a paper published in *Experimental Mathematics* are two: some experimental aspect, and relevance to mathematics proper. The word "experimental" is conceived broadly: many mathematical experiments these days are carried out on computers, but others are still the result of pencil-and-paper work, and there are other experimental techniques, like building physical models. As for the second ingredient, we emphasize the distinction between experimental mathematics and applied mathematics. We like to hear about interesting applications to the "real world," but our focus is on work that will have a theoretical impact and contribute to the development of mathematical ideas.

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Within this framework, here are some types of paper that we regard as suitable for publication. (See the end of this issue for submission instructions.)

EXPERIMENTS that give rise to new theorems or new conjectures, or lend support to existing conjectures, or point to areas that ought to be investigated. **NEW THEOREMS** proved with the help of experimental results are highly acceptable, and authors should submit the formal proofs as well as information about the experiments—it is not our purpose to encourage the proliferation in different journals of papers based on the same piece of research.

When a new result cannot be proved, conjectures should be formulated as precisely as possible: "There is clearly something going on that needs to be explained" is not enough. The discussion should make clear why the conjecture is interesting, what prior work contributed to it, what one could deduce from it, and what special cases one can already prove.

Computer experiments should be reported in such a way that they can be repeated by other researchers. Ideally, the programs used for the experiment should be made freely available in electronic form to other researchers, to the extent that this is within the author's control (see also "Description of Computer Programs", below). This will allow others to check whether all borderline cases have been tested, whether the author's interpretation of the results is the only one possible, and so on. Referees are encouraged to request programs for testing, and authors are expected to comply even if they will not make the programs publicly available.

Results of computer experiments should be presented in such a way as to be graspable by humans. This is seldom the case with long chunks of computer output. For this reason, printouts of interactive computer sessions will not be published, except perhaps for short excerpts illustrating specific points. Computer-generated tables can be published, after appropriate reformatting, if their reference value is commensurate with their size.

ALGORITHMS for the solution or exploration of mathematical problems, including theoretical or experimental analyses of complexity. We use the word algorithm in a somewhat loose sense: a procedure does not need to terminate in all cases in order to be useful in mathematical exploration.

Publishability depends partly on the intrinsic interest of the algorithm or proof of complexity, and partly on the importance of the mathematical problem at which it is directed. Description of a previously known algorithm may be acceptable if the algorithm is put to an original use or if new information about its complexity is uncovered.

Discussion of **PRACTICAL ISSUES**. Papers discussing techniques and pitfalls involved in experimentation will be published if they present an original contribution and have a core of mathematical interest. We are not interested in stories of blunders, but if there is a non-obvious phenomenon to describe, we would like to hear about it.

Descriptions of **COMPUTER PROGRAMS**. Authors of computer tools for mathematical investigation can describe them and the uses to which they have been put. The discussion should be geared toward *potential* users of the program. Potential users do not want a manual detailing what buttons are pushed when; they want an overview of what the program can do, including general features, specific examples, and representative benchmarks.

Authors can also discuss algorithms and implementation issues, if this will help builders of similar or related tools. Program source listings will not be published, except for very short passages illustrating specific points.

We encourage authors to make their programs freely available to the public, in source form, taking advantage of the increasing number of electronic distribution alternatives. Openness in sharing software will definitely influence acceptance decisions. We are considering the possibility of establishing an electronic distribution site associated with *Experimental Mathematics*.

We also intend to run an unrefereed **PROGRAM COLUMN** announcing programs of mathematical interest that are distributed free of charge (or for a nominal charge covering media costs). Authors of such software should submit a description, up to 300 words long, concentrating on what the program can do for the mathematician.

SURVEYS of particular areas of mathematics, from the experimental point of view. Contributions from researchers closely involved with the field in question are especially welcome.

ESSAYS, HUMOUR, POLEMIC, CORRESPONDENCE. This is a grey area that will become better defined as we go along. Warning: We do not intend to publish fuzzy, meandering prose. Material submitted under this rubric, more than any other, should be clearly written, well argued, and no wordier than necessary.

IN CONCLUSION, many mathematicians have been reluctant to publish experimental results. Those who have tried it have sometimes found the best-known mathematical journals unwilling to accept such material, regardless of merit. *Experimental Mathematics* is an effort to change this situation. We envision it as something akin to a journal of experimental science: a forum where experiments can be described, conjectures posed, techniques debated, and standards set. We strongly believe that such a forum will further the healthy development of mathematics.