

The Humanistic Mathematics Network Journal: A Bibliographic Report

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Recommended Citation

Nurullah E. Goren & Tiffany Zhu, "The Humanistic Mathematics Network Journal: A Bibliographic Report," *Journal of Humanistic Mathematics*, Volume 8 Issue 1 (January 2018), pages 140-270. DOI: 10.5642/jhummath.201801.10. Available at: <https://scholarship.claremont.edu/jhm/vol8/iss1/10>

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The Humanistic Mathematics Network Journal: A Bibliographic Report

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Synopsis

The content of the *Humanistic Mathematics Network Newsletter* was reviewed by Claire Skrivanos and Qingcheng Zhang in [2]. This report reviews the content of the *Humanistic Mathematics Network Journal* (1992-2004).

The Humanistic Mathematics Network Journal (HMNJ) began in 1987 as the *Humanistic Mathematics Network Newsletter*, curated and edited by Alvin White, professor of mathematics at Harvey Mudd College. The readership and submission sources were predominantly mathematics professors at the university level, though there were some papers authored by undergraduate students and people working in primary and secondary education. The publication gradually grew in readership to almost 3000 subscribers worldwide. It ceased publication in 2004, but its spirit continues on in the *Journal of Humanistic Mathematics*, currently edited by Mark Huber (Claremont McKenna College) and Gizem Karaali (Pomona College). The HMNJ archive has recently been fully scanned and is now available for download at <http://scholarship.claremont.edu/hmnj/>.

We set about the project to document and analyze the HMNJ corpus over the summer of 2016 under the supervision of Professor Gizem Karaali.

Our task was twofold: to create an annotated bibliography of the journal for future use, and to make an inquiry into the definitions that humanistic mathematics had taken on throughout the lifetime of the journal. We worked with issues 7-27 of the journal during this time.

The content of the *Humanistic Mathematics Network Newsletter* (Issues 1–6) was reviewed by Claire Skrivanos and Qingcheng Zhang in [2]. This report reviews, through the use of quotes and brief summaries, the content of the *Humanistic Mathematics Network Journal* (Issues 7–27, 1992–2004).¹ We also include some of our reflections (in footnotes).

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¹ Our work on the conceptual foundations of humanistic mathematics is ongoing.

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1. Issue 7, April 1992. ISSN 1047-627X

[This issue](#) marks the change of the publication's title from "Humanistic Mathematics Network Newsletter" to "Humanistic Mathematics Network Journal", reflecting the growth that the journal has gone through.

The cover has a drawing by d'Arcy Hayman, originally drawn for "THE CALCULUS VIRGIN: An Artist's View of the Language of Calculus". It depicts two humanoid figures. An explanation of these figures can be found in the inside cover of this issue. One of the figures, the "technology man", is wearing prison stripes and has a large contraption strapped to his back; the other his human master. This piece reflects on the function of technology, which is to obey humanity.

The inside cover also credits those who worked to compile this journal. The editor is Alvin White (Harvey Mudd College), just as he was in the previous six issues. The associate editors are Harald Ness (University of Wisconsin Cetner) and John Haack (University of Iowa).

Many of the submissions in this 98-page issue are concerned with the current state of the education system, saying that dry, human-less mathematics is not the correct way of teaching. There is also mention of the large role that mathematics has in culture.

1.1. *From Newsletter #1* by Alvin White

The issue opens with a letter from Alvin White, published originally in the first issue and appearing in every subsequent issue up to this point. He describes two overall themes² presented in the discussions of humanistic mathematics at related conferences:

- (1) teaching mathematics humanistically
- (2) teaching humanistic mathematics

Admittedly this categorization is not mutually exclusive or even clear-cut.

The letter itself, dated August 3, 1987, was written after the Conference to Examine Mathematics as a Humanistic Discipline, held in Claremont, California, over the course of three days (March 21–23, 1986).

White mentions the role of intuition in the conception of mathematics, and points to a range of human elements in mathematical discovery, such as competition, cooperation, urge for holistic pictures. He asserts that value judgments have a large role in what, how, and why things are investigated. Mathematical knowledge is typically presented to students as certain and merely received; humanistic mathematics points toward teaching methods and approaches that aim to make students aware of the humanistic dimensions of the discipline. Encouraging mathematician-like thinking in students by giving tasks of low definition, participating in controversy, etc. are all parts of this approach.

Another theme White touches upon is the need for the mathematical community to show due respect for research on teaching-related issues.

He also introduces the journal, then called a newsletter:

“The newsletter will help create a network of mathematicians and others who are interested in sharing their ideas and experiences related to the conference themes. The network will be a community of support extending over many campuses that will end the isolation that individuals may feel. There are lots of good ideas, lots of experimentation, and lots of frustration because of isola-

² Both themes focus on teaching; one focuses on humanistic ideas in the education process, the other in the mathematical content.

tion and lack of support. In addition to informally sharing bibliographic references, syllabi, accounts of successes and failures . . . the network might formally support writing, team-teaching, exchanges, conferences . . . Please send references, half-baked ideas, proposals, suggestions, and whatever you think appropriate . . .”

1.2. From the Editor by Alvin White

Here, White discusses the change in the name of the publication from Newsletter to Journal. He also describes the process for signing up for the mailing list and gives short summaries of most of the pieces and collections presented in this journal.

1.3. Three Comments on Ethics by Saunders Mac Lane

This is a short piece by Saunders Mac Lane, from the Department of Mathematics at the University of Chicago. It is a series of comments on the contents of Newsletter #6. The ethics that he discusses here refer to the use of others' results in one's own work. In Henry Whitehead's words, "never accept in your own work a result which you could not yourself prove." Mac Lane pushes against this idea, saying that checking the vast amount of proofs present for certain topics, such as the classification of finite simple groups, is an unnecessarily massive use of time and effort.

He also mentions that the presence of proofs makes mathematics less prone to doctored errors, so much that a full course on ethics in mathematics is not necessary.

1.4. Toward a Definition of 'Humanistic Mathematics' by Sherman Stein

In this article Stein discusses his misgivings about lauding something that's "humanistic" given that he sees people in the humanities as no more human than their STEM counterparts. Furthermore, he points out that the Conference did not define "humanistic", so he took it upon himself to do so. Thinking about what all of the humanistic mathematics topics had in common did not lead him anywhere. In the underlying mood, however, he found a desire to influence students in ways beyond mathematical skills. In other words, what seemed to make sense was humanistic mathematics instruction, not humanistic mathematics (in the way that no

one theorem is humanistic).³ This can be expanded to thinking about humanistic and non-humanistic tendencies in other fields, even humanities.⁴ Mathematics is subtly a very suitable vehicle for humanistic instruction, in that it gives students the ability to draw conclusions on the faith of their own ability rather than taking every morsel of knowledge from a teacher or book.⁵

1.5. Poems Taken From “An Evening Of Mathematical Poetry”

This section consists of a collection of poems presented at the National Joint Mathematics Meetings in Baltimore, Maryland on January 10, 1992. The collection takes up a good deal of the journal, spanning eighteen pages.

1.6. Letter From John S. Lew to Joanne S. Growney

Lew wrote his letter after having met Joanne Growney and Alvin White at the poetry reading described in the previous section. The next section, an extensive bibliography on mathematics in literature, demonstrates his knowledge and passion for both mathematics and literature.

Lew was a member of the Mathematical Sciences Department in the IBM Research Division at the IBM T.J. Watson Research Center at the time of writing. His most prominent complaint is with Growney’s quiz [1] published in the *American Mathematical Monthly*’s February 1992 issue, where she attempts to demonstrate that mathematics and poetry are “fundamentally similar”. Lew’s thesis is that although they are similar on some level, this level is so abstract and vague that in fact, they are no more similar to each other than they are to other fields. He lists specific comments on the quiz, such as “This is a metaphor for the feeling of wonder, but other things can excite wonder” (page 24) and “Nemerov’s statement describes poetry, and it describes mathematical ELEGANCE, but it does not describe MATHEMATICS. Birkhoff’s long proof of the pointwise ergodic theorem is mathematics.

³ Could one present curiosity, critical thinking, desire for proofs, appreciation of substance and beauty of math as basic mathematical skills that are also humanistic?

⁴ The idea that comes to mind is rote-memorization history, Strunk and White English prescriptivism, etcetera.

⁵ “Every step can be checked and independent exploration can be carried out” (page 3) is not necessarily true. Math has axioms, too, which are analogous to, if not the same as, the “key assumptions of faith” that Stein mentions.

The later short proofs are elegance, but Birkhoff's version was already mathematics" (page 25).⁶ He goes on to write about how few mathematicians write poetry, and how Wallace Stevens, "one of the great 20th century poets", draws inspiration not from mathematics but from philosophy. "His poetry weighs and develops concepts in an area that is NOT mathematics, but has enough of the semblance of reason so that one might think his poems would interest mathematicians" (page 25). However, he says, he never met a mathematician who has seriously read Stevens.

1.7. Mathematical References In Literature by John S. Lew

This collection of mathematical references in literature is somewhat of a companion piece to the letter in the previous section. The annotated bibliography divides mathematical references into collections, novels, plays, nonfiction, and short stories, science fiction short stories, poems, real mathematicians in literary works, autobiographical memoirs, films, and songs.

1.8. Epistemological Pluralism: Styles and Voices Within the Computer Culture by Sherry Turkle and Seymour Papert

This piece deals with styles of computer programming that are often considered non-canonical and thus shunned by most people in the field. It was reprinted with permission from *Signs: Journal of Women in Culture*.

"Evelyn Fox Keller has remarked on the difficulty that people face when they try to understand what it might mean to do science in anything other than the formal and abstract canonical style" (page 49)

People who desire transparency and the ability to keep in touch with their work often find themselves at odds with "black-box" programmers and professors who force them to program this way.

⁶ When discussing humanistic mathematics, much discussion goes into the desire for elegance in mathematics. One could even say that mathematics is the pursuit of elegance in modeling reality, in which case the more elegant your mathematics is, the more mathematics it is. Is it possible for poetry to be so inelegant that is no longer poetry, but merely a series of words? Is it possible for gymnastics to be so inelegant that it can not be characterised as being "gymnastics", but merely a tumble?

There is some discussion of the language of science with regard to gender, especially with nature as female and other scientists as male:

“... aggression has become a part of widespread cultural understanding of what it means to behave in a scientific way. Its methods are expected to involve “demolishing”... If science is first a rape, it is then a duel.” (page 59)

1.9. Mathematics as a Humanist Discipline by Elena Anne Marchisotto

This is a look at the state of mathematics in higher education (as of 1992) from a professor of mathematics.

“Mathematics has not retained such a dominant position in modern education” (page 69)

“Mathematics Departments are considered service departments, offering the majority of their courses to students in fields other than mathematics. Such departments as Engineering, Computer Science, Business, the Physical Sciences, and the Social Sciences include a core of mathematical courses which are essential to meet the mathematical needs of their majors.” (page 69)

“However, **teaching** mathematics as a service course has some built-in liabilities. The experience of teaching mathematics to students for whom the subject is not their major field is often less satisfactory than teaching mathematics majors.”

One crucial problem with mathematics is the isolation of the different sub-fields (algebra, geometry, arithmetic) in early (and later!) education.

“Mathematics professors must help students understand mathematics in its historical perspective, with its creative present and imaginative future.” (page 75)

1.10. What is Mathematics and Why Don't They Know That? by Harald M. Ness

Ness is concerned that most students do not know what mathematics is really about.

“I have tried, occasionally with success, to instill in these students a broader view of mathematics, and an understanding of mathematics as an integral part of our culture, and the part mathematics plays in the development of culture.” (page 77)

Ness gives an anecdote about upper-division undergraduate math majors at a liberal arts college, who had a discussion about the meaning of mathematics, and the only thing they could come up with was that it was the “science of numbers”. He blames this all on the way mathematics is taught: teacher does problems on the board, students do some problems, check answers in the back.⁷

Ness nominates, as a “starting point”, the definition of mathematics as described in the Lawrence University catalogue.

“Born of man’s primitive urge to seek order in his world, mathematics is an ever-evolving language for the study of structure and pattern . . . It is at once pure logic and creative art.” (page 78)

He finds serious issue with the fact that many institutions and people neglect mathematics as an integral part of culture.

1.11. Writing Humanistic Mathematics by Ruth Hubbard

This is a set of guidelines for writing effective mathematics teaching texts. More than other subjects, in mathematics, the teacher is the conduit between text and student.

⁷ This opinion piece and the others like it seem to be reactionary pieces from the time period, given the sweeping generalizations of the sorry state of mathematics education. Today there are problems in mathematics education, but they seem somewhat different. But in any case, these essays raise some important questions which are not themselves dated. For example: Is it not possible that in order to understand and appreciate what such authors regard as the heart of mathematics, students need to be good at math? Just like to appreciate fine English literature, students need to be able to read. Ness has, we presume, never been horribly and dissuadably terrible at elementary arithmetic. Yes, there are bad teachers and good teachers, but no, it is probably not as simple as slapping your hands on the desk telling everyone that they need to do more than teach process memorization.

“Landbeck (1990) found that of the 65% who reported negative experiences, most attributed these bad experiences to bad teachers.” (page 81)

Students are increasingly becoming forced to become independent learners, not by the nature of the text/course or from pedagogic virtue but because of financial constraints. They are however not well-served by the textbooks. Hubbard first tried to teach students how to read mathematical texts effectively, with limited success. She points out that textbook language is written to be concise and precise and sequential.⁸ She then lists some criteria for readable mathematics, such as short sentences and simple vocabulary. Additional advice includes using computers to facilitate mathematical understanding, such as using computer simulations and word processors.

1.12. The Profit Motive: The Bane of Mathematics Education by Neal Koblitz

Koblitz continues the discussion on textbooks. He notes that textbooks are bulky, expensive, and not very useful for most of their words. Koblitz and others have turned to “guerrilla publishing”—creating their own texts and distributing them at little cost and little profit, tailored to the course. Computers have just recently (recall that this is 1992) been made commercially available and are being offered as gadgets rather than deeply considered as an educational tool, especially in the face of public demands to improve education and the desire to impress families and alumni with their resources.

Another complaint raised in this piece is that instructor popularity among students is equated with effective teaching.

1.13. Mathematics - From an English Major's Point of View by Elizabeth Miller

Elizabeth Miller was a sophomore English major and enrolled in a Mathematics and Culture class the previous fall. This piece was submitted by the professor, Kathleen Shannon. The prompt for this final paper was open ended. In particular, Miller's paper sought to

⁸ Could this be at all related to the fact that mathematicians are trained to be concise, precise, and sequential in their proofs? Recall that mathematicians publish for other mathematicians. Publishing for students should be (but isn't) treated entirely differently.

“explore the concept of mathematics as a cultural system or a sub-culture in and of itself, its subsequent evolution, and the multiple characteristics thereof . . . mathematics is more than a method, an art, or a ague; it is a body of knowledge that serves the physical and social sciences and the fields of theology, art, and philosophy.” (page 93)

The rest of the paper examines the evolution of mathematics as derived from the environment, the practical and abstract foundations of mathematical thought, the role of diffusion of mathematics in culture, cultural lag and resistance in mathematics, the importance of symbols, and “abstraction as an inevitable future” (page 97).

2. Issue 8, July 1993. ISSN 1065-8297

The cover of [this issue](#) depicts what is described on the inside cover as an “inverted mushroom”, traced by a single orbit of a nonlinear system of three differential equations. The functions model voltage across a simple two-looped electrical circuit.

The editor for this issue was Alvin White (Harvey Mudd College), and the associate editors were Harald Ness (University of Wisconsin Center) and Joel Haack (University of Iowa); the same editorial team as in the previous issue.

Unlike the previous seven issues, however, this one does not include a reprint of the letter “From Newsletter #1” by Alvin White. Still the issue is thick, with 76 pages.

A great deal of the pieces in this issue deal with current problems in teaching at the undergraduate level and how to remedy the problems of underachievement and lack of student retention. There is also a lot of focus on changing the public opinion of mathematics as elitist, cold, alienating.

2.1. From the Editor by Alvin White

Here, White gives summaries of some of the pieces in the issue, highlighting ones that illustrate the changes needed to empower students more in mathematics classrooms.⁹ He also states that “every essay and poem in the journal helps to describe and define humanistic mathematics”.

⁹ This suggests that this issue will deal primarily with strategies for empowering mathematics students.

“Humanistic mathematics carries with it an awareness of and a sensitivity to what mathematics shares with the other humanities.”

These include appreciating the role of intuition in mathematical creativity, and understanding the role human judgment plays in the evolution of any discipline. More specifically, White lists the following two characteristics as part of his vision for humanistic mathematics:

“an appreciation of the role of intuition in understanding and creating concepts that appear, in their finished version, to be a result of a ‘merely technical’ process”

and

“an understanding of the value judgements in the growth of any discipline. Logic alone never completely accounts for what is investigated, how it is investigated, or why it is investigated.”

He also notes that humanistic mathematics has gained widespread, mainstream appeal, even among those who may not have heard the term.

As always, White describes how to acquire a copy of the journal and he includes instructions on how to become involved in the network.

2.2. *Calculus Workshop Groups as a Humanistic Experience* by Martin Vern Bonsangue

Despite the best efforts of many organizations, systemic barriers to academic success and inclusivity remain for women and students of color in the mathematical community. This article reports on the results of a study into the efficacy of a program at California Polytechnic State University, Pomona, in which Latin American, African American, and Native American students were invited to participate in an intensive bi-weekly workshop on calculus. Some reflections follow on the success of minority-only workshops in first-year calculus courses (inspired by Uri Treisman’s work at Berkeley [?]) and how we can change the education system to be more supportive of students who lack role models in the faculty.

Bonsangue, a mathematics professor at California State University Fullerton, first addresses the dearth of people of color in mathematics, somewhat in the student body but especially in the faculty. In 1989-90, only one person of color graduated from the California State University system with a

masters degree in mathematics (out of 98 awarded in the system that year). Problems with student performance are often attributed purely to the student but have origins in the institutions we work under, such as styles of teaching, presence of role models, and emphasis on standardized test questions whose predictive validity for underrepresented minorities is questionable.

To counter this narrative and to change the status quo, Bonsangue describes twice-a-week optional workshops organized exclusively for Latino, African-American, and Native American students at the California Polytechnic State University, Pomona. Students participating in these workshops showed impressive results in grades and retention of major, especially for women, with higher rates when compared to both the general student body and to other students of underrepresented minorities who did not attend the workshops.

The correlation-causation worries regarding this study are addressed. Past achievement (SAT scores), studying habits, and free time were accounted for and did not have significant effects.

The community of minorities made some students feel freer to embrace their heritage. Many, although not all, students felt as though they would not have done as well in their courses had they not participated in the workshop. This sentiment was especially pronounced among the female participants.

“At the very least, the Cal Poly Workshop Experience suggests that achievement among underrepresented minority students in mathematics, science, and engineering disciplines is less associated with pre-college ability than with in-college academic experiences and expectations. The rub is that academic departments must see as part of their work the creation of structures and fostering of attitudes that develop academic talent and promote student involvement.” (page 9)

All in all although a small number of students reported feeling disgruntled because they were singled out for their ethnicity, in general the students felt as though the workshop strengthened their sense of inclusion in both the mathematical community and their own ethnic communities. Even so, many still reported feeling significant barriers to inclusiveness, especially due to a lack of role models in higher education. These attitudes were strongest among the women in the program.

Bonsangue decries what he identifies as many of the ills of modern mathematics education, which are as follows:

“competition is necessary to motivate learning,
 noise is distracting,
 telling is teaching,
 paper-and-pencil assessment is adequate,
 it is cheating to get help from another person,
 feelings are not part of the academic environment,
 the system is OK.”

2.3. *Like Poetry, Mathematics is Beautiful* by JoAnne Growney

Growney is a professor in the Department of Mathematics and Computer Science at Bloomsburg University. Her poem reflects on how people tend to regard mathematics as merely useful when it is beautiful as well. This poem supposes that mathematics, like poetry, is a beautiful mode of human expression. Growney laments the widespread societal overemphasis on the utility of mathematics, which neglects this perspective.

2.4. *Toward a Philosophy of Humanistic Mathematics* by Bill Rosenthal

Rosenthal was part of the Department of Mathematics and Computer Science at Ursinus College as well as the Department of Teacher Education at Michigan State University. This piece is a reaction to Sherman Stein’s “Toward a Definition of Humanistic Mathematics” published in the previous issue (Issue #7) of the *Humanistic Mathematics Network Journal* (see Section 1.4).

Rosenthal starts by noting that in spite of many significant important developments in the evolution of humanistic mathematics, the term “humanistic mathematics” still lacks a concrete definition.

“We still can’t agree upon a definition of our reformulation of the so-called Queen of Sciences . . . [we] invite the scorn of those . . . who excoriate us for oh-so unmathematically developing out discipline before defining our terms.” (page 11)

The desire for definition is bound in proofs and theory.

“I believe that the desire to define humanistic mathematics . . . arises from the values of a culture rooted in an ideology of theory.”

Rosenthal jokingly fears the coming of theorems, proofs, and technical lemmas of humanistic mathematics accompanied by applied, universal, and homological subfields analogous to “non-humanistic” mathematics.

But if we can separate ourselves from the logic of proof and theory, then definition may not be so necessary. Rosenthal suggests that perhaps it is not important or useful to define humanistic mathematics as it is to ponder the meanings of our efforts. In linguistics terms, he proposes descriptivism over prescriptivism, and celebration of questions. He argues that instead of bogging humanistic mathematics down with needless rigour and rigid definitions, we should embrace an open-ended and exploratory humanistic philosophy. Such a philosophy will enable intellectual growth, conceptual evolution, and interdisciplinary integration with other humanistic fields.

“I propose that we engage in the devotion of a philosophy of humanistic mathematics by pondering and questioning its multitudinous meanings and what we are doing with them. May we seek to refine, expand and characterize rather than to define, constrain, and circumscribe.” (page 12)

Rosenthal uses the metaphor of indefinite integration:

“A philosophy of humanistic mathematics—*a humanistic mathematics of philosophers*—will inspire and organize an infinite indefinite integration of humanism, mathematics, and philosophy and now unforeseen, now unforeseeable.” (page 12)

2.5. *Writing Style—An Editorial Comment* by Harald Ness

Harald Ness writes about writing style from his perspective as one of the two associate editors of the Journal. Mathematics is a humanistic field. As such, mathematical writing ought to be accessible to all interested parties. Therefore, mathematicians should try to avoid writing overly stodgy or technical pieces when possible.

“There is great diversity among our members as to what Humanistic Mathematics is. However, there is one aspect that is common to most, if not all, of our views. That is that mathematics belongs most appropriately in the humanities.” (page 13)

Ness makes a plea to the community to make their writing less jargon-y and pseudo-esoteric and more humanistic, as it drives many people away from mathematics. Also, he calls for people to be more tolerant of various writing styles, even the research mathematicians,

“bless their little hearts, who will likely will continue to write in their stilted, stark manner.” (page 13)

2.6. *Letter about Philosophia Mathematica* by Robert Thomas

This is a letter from Robert Thomas to Alvin White, relaying information about the journal *Philosophia Mathematica* and about the Canadian Society for History and Philosophy of Mathematics, in the hope that any readers of the HMNJ may take interest. Following in the journal is a list of speakers for the Canadian Society for History and Philosophy of Mathematics annual meeting in 1991.

2.7. *Canadian Society for History and Philosophy of Mathematics speaker list*

This is the list, mentioned in the letter described in Section 2.6 by Robert Thomas, of speakers for the Canadian Society for History and Philosophy of Mathematics annual meeting in 1991, including those for the special session on women in mathematics.

2.8. *The Role of Faith in Mathematics* by Dick Wood

Wood, from Seattle Pacific University, talks about the application of faith in mathematics and the necessity for teaching the role of that faith in mathematics education.

Wood argues that, just like the “scientific method” for the physical and natural sciences, there are basic foundations upon which mathematical concepts are rooted. But many students remain unaware of the numerous formal logics and philosophies to the meaning of “proof”. Furthermore, most students take mathematics for granted, without giving much thought to the axioms and assumptions which underlie all mathematical systems. But these axioms must be consistent, or else they are meaningless. The consistency of many of these axioms, such as Peano’s arithmetic, must be taken on faith. Moreover, theorems must often be taken on faith because mathematicians don’t have the time or the knowledge to review the proofs of every theorem that they use.

This faith in our predecessors, of course, can't really be helped in the most trivial cases—time is limited. But

“We must realize that mathematicians are human—and hence, fallible.” (page 17)

And

“We need to realize all of the basic assumptions, hiding nothing.” (page 18)

In short, faith is not contrary to the goals of mathematical analysis. Faith is necessary and convenient.

2.9. Developing a Mathematical Mode of Thinking in an Undergraduate Program by Ida Doraiswamy

Doraiswamy, from Elizabeth City State University, suggests ways for undergraduate mathematics education to foster critical thinking in students and encourage them to seek mathematical beauty through exploration.

Many individuals think of mathematics as nothing more than computation. Even in undergraduate institutions, mathematics is shamefully reduced to the development of computational skills and the acquisition of mathematical knowledge. Many students continue to learn that

“every characteristic or phenomenon of the real works could be measured and depicted by a number and that they should make their decision by this number. In my judgment, this is a mistaken notion about the world and about mathematics.” (page 19)

But in fact,

“Mathematical thinking . . . is pursuing an idea with valid arguments. Given a problem, mathematical thinking calls for finding the premises and finding the appropriate reasoning to arrive at conclusions . . . therefore seeing, analyzing, abstracting, remembering, reasoning, synthesizing, discovering, representing and questioning, all constitute mathematical activity.”

As such Doraiswamy equates mathematical thinking with critical thinking, and argues that the goal of any undergraduate mathematics program is to encourage students to develop critical thinking abilities. In particular she calls for the critical conceptualization of accepted postulates, for students to become “an active participant instead of being a silent recipient.” (page 20) Suggestions to foster critical thinking in undergraduate mathematics courses include more exploratory, reader-driven textbook writing styles, exploratory and simple course content, and cultivatory opportunities, such as lab programs or individual study programs. Doraiswamy then outlines some guidelines for creating a rewarding lab program. All suggestions are meant to make the beauty of pursuing mathematical ideas more appealing to the students.

2.10. Math Nonsense Verse by Helen Lewy

Helen Lewy, noted here as the widow of [Hans Lewy](#) (American mathematician, known for his work on partial differential equations and on the theory of functions of several complex variables) presents a series of silly limericks and one double couplet, about as various subjects as Bessel functions, programming, and Möbius strips.

2.11. A Reading List for Undergraduate Mathematics Majors: A Personal View by Paul Froeschl

Froeschl, from the University of Minnesota, Twin Cities, presents three lists, “Classics”, “Bedsides”, and “Lark’s Songs”, of recommended books for mathematics undergraduates. The first list contains classic literature related to mathematics such as *Flatland*. The second list contains less challenging, leisurely literature related to mathematics. The final list contains beautiful and essential works of mathematical literature. Not all are strictly about mathematics; for example, the Classics list starts off with *Alice’s Adventures In Wonderland* and *Through The Looking Glass* by Lewis Carroll.

2.12. Mathematics and the Arts—A Bibliography by JoAnne S. Growney

Growney has prepared a long bibliography (some entries are annotated) for any individual interested in exploring the connections between art and mathematics. The list is extensive, spanning pages 24–36 of the journal This bibliography grew out of a course called “Mathematics and the Arts” taught by Growney at Bloomsburg University.

2.13. On Attracting Mathematics Majors by Kazem Mahdavi

Mahdavi, professor at State University of New York, gives advice on how to make students driven mathematics majors, focusing on the role of the educator.

Mahdavi starts by noting that students who are naturally talented in mathematics, or who are sufficiently hardworking, typically succeed in the field, even if their teachers are ill-suited to their learning needs. Thus, teachers should direct their efforts towards students who are only able to succeed in a nurturing and encouraging environment.

Mahdavi argues that the goal of mathematics instructors should be to cultivate in their students an interest in mathematics. He also contends that mathematics instructors should encourage their students to pursue additional coursework in mathematics.

“What if we set the current goal in teaching: after taking a course in mathematics the student should wish to go on and choose another course in mathematics or to continue toward graduate school or to continue to be a scholar in mathematics.” (page 38)

Although this approach may result in less content taught to the students, more students end up driven to pursue other mathematics courses, and gains mathematical maturity to read up on the otherwise missed materials. Mahdavi makes the point that although not ever students in this system will turn into a world-class mathematician, having a math degree gives students good problem-solving skills applicable in most careers or majors.

Students and teachers shape each other through their interactions, and any good mathematics department has to be aware of this dynamic. Whether an instructor criticizes the student’s ability or nurtures it greatly shapes whether a student continues in mathematics. There is a false image of difficulty, impenetrability, and elitism which surrounds mathematics. This discourages students from getting involved with what is in fact a very joyous, rewarding, and intellectually stimulating field.

“The attitude that conveys to students that mathematics is only for the elite, that they are unable to be successful since they are making mistakes, the attitude that half the students should drop out since they can not keep with the teacher is probably not going to attract students to mathematics.” (page 39)

In order to cultivate mathematical interest in their students, mathematics instructors must have the proper attitude. This attitude is characterized by being helpful and approachable, by being passionate about the subject, by being genuinely interested in the students, by not being elitist, and by not being grade-oriented. When a student approaches a mathematics instructor for help, the instructor should think paternally about how they can help the student with their issues.

Easily recognizable role models in mathematics would encourage more students to pursue mathematics.

Lack of resources/respect for faculty also plays into the negative impression society has of mathematics, that is is hard and dry and unacceptable unless it is perfect. Mathematics professors are at their most effective when their department administration is helpful and works towards creating a comfortable workplace environment. Different teaching styles attract different types of students. Therefore, mathematics departments can attract more students by hiring instructors with a wide variety of distinct teaching styles.

2.14. The Basis for the Success of the Potsdam Program by Rick Luttmann

This is a manifesto for the Potsdam mathematics department, written down by Luttmann based on a visit to Potsdam College in April 1987. There are seven parts: “success in mathematics is due much more to hard work than to innate talent” . . . “suspend disbelief” with respect to students whose past records have been undistinguished . . . keep up morale . . . abandon the traditional lecture format of teaching . . . emphasis should be on maturity and technique, not merely content . . . all courses should be oriented towards pure mathematics . . . an atmosphere must be engendered of total support for the student.”

2.15. A Humanistic Academic Environment for Learning Undergraduate Mathematics by Clarence F. Stephens

Stephens is a professor emeritus at the State University of New York Potsdam, the institute praised in the previous piece. This article was reprinted from the Humanistic Mathematics Network Newsletter #3, published originally in December 1988.

In many mathematics programs, faculty are not very willing to teach undergraduate students, and many of the classes are remedial or pre-calculus

classes, with environments that do not encourage learning. Potsdam Mathematics department has “made a determined effort to establish a humanistic academic environment for learning undergraduate mathematics.” (page 47) As a result, there is a far greater proportion of mathematics majors at Potsdam as well as a far better gender balance within in the department. In general, students enroll voluntarily and not for requirements.

Stephens emphasizes the lack of placement exams, instead offering optional honors courses to students with high achievement in the past. This same professor has also overseen similar changes in the mathematics program at Morgan State University, Baltimore, Maryland, and therefore concludes that this achievement is possible at any institution.

In PhD-granting mathematics departments, undergraduate education is typically handled by graduate students. In the rare case where professors do teach an undergraduate class, it is often in a very large and impersonal setting. Either way, undergraduate mathematics students are not getting the education they need. In mathematics departments which grant master’s degrees or bachelor’s degrees, most mathematics courses are either basic or remedial. “Students do not enjoy studying these courses and teachers do not enjoy teaching them.” At technical colleges and community colleges, there is little to no opportunity for professors to teach mathematics humanistically. The Potsdam mathematics department has made a concerted effort to teach humanistically. Consequently, gender discrepancies have vanished, there is no more conflict between concrete and abstract mathematics, and there are many mathematics majors.

Stephens identifies a number of policies which have led to the development of this humanistic environment. Upon entering college, qualified students are invited to participate in an honors calculus course. The department makes it relatively easy to complete a bachelor’s degree or a master’s degree in mathematics. The department does not administer placement exams, even for advanced courses. Teachers are free to teach however they please. This humanistic environment at Potsdam was developed over the course of fifteen years. Presumably, by employing the same practices other colleges could develop a humanistic environment in a similar time frame.

2.16. Liberal Education in the Liberal Sense by Annalisa Crannell

This is the text of a speech given by Annalisa Crannell, starting faculty member at Franklin and Marshall College. Crannell was a graduating student

speaker at Brown University's Graduate Commencement Ceremonies in the spring of 1992.

Crannell begins by noting that many people hold a particular fondness for ignorance when it comes to mathematics, eagerly offering their own inability to do well in it. She laments the shift towards specialized knowledge at the expense of other disciplines rather than the dedication to broad knowledge. Undergraduate studies in America demand a broad range of studies, but those studies are narrowed significantly when one reaches graduate school.

Overall Crannell makes a detailed argument in favor of intellectual diversity and liberal arts education, and disparages the widespread preference for specialization at the collegiate level.

2.17. *The Popular Image of Mathematics* by Paul Ernest

Ernest, from the School of Education at Exeter University in the UK, approaches the problem of the negative public view of mathematics from his position as part of the Philosophy of Mathematics Education (PoME) network.

Mathematics is often considered a faraway, anxiety-inducing concept. To counter this, there not only should be efforts to change the public view, but to change—humanize—the populace's encounters with mathematics. His question is: *What can PoME uniquely contribute?*

In many schools and colleges, the image of mathematics is not an accurate way to describe the mathematics being done—in these institutions, mathematics is much less cut-and-dry, more chaotic. Race, gender, and class are also factors. Mathematics

“offers access most easily to those who feel a sense of ownership of mathematics, of the associated values of western culture and of the education system in general. These will tend to be males, to be middle class, and to be white. Thus the argument runs that the popular image of mathematics described above sustains the privileges of the groups mentioned by favouring their entry, or rather by holding back their complement sets, into higher education and professional occupations, especially where the sciences and technology are involved.” (pages 54–55)

Mathematics is widely (and falsely) regarded as a cold, inhuman, impenetrable, masculine, elite field. This induces great fear and anxiety in many students who might otherwise have found success in mathematics.

Since too many teachers accept this image of mathematics, too many students experience mathematics in a fashion consistent with its negative image. However, this needn't be the case, as demonstrated by the maverick tradition. The popular image of mathematics feeds into white, upper-middle class, male values and by extension, white, upper-middle class, male privilege. This may explain why the race and gender composition of mathematics students is so unbalanced. The Philosophy of Mathematics Education (PoME) network is uniquely situated to rectify this problem.

2.18. Poems by Lee Goldstein

A collection of eight non-rhyming poems, spanning six years. Self-reflective and philosophical, the poems deal with particular concepts in mathematics or with applying mathematical concepts to other fields.

2.19. A Multicultural Matrix for Mathematics Education by Rheta N. Rubenstein

Rubenstein, from the University of Windsor in Ontario, Canada, offers a structure with which to integrate cultural and mathematical education.

Getting students interested in mathematics in an increasingly diasporic world is not always an easy task. Presenting applications and theorems specific to a student's culture, however, can engage that student, even in spite of the inherent difficulty of mathematics. With this in mind, Rubenstein presents a matrix of two dimensions, relating cultural features to specific mathematical topics. There are six categories for the first dimension of cultural features: language, history/geography, exconomics/politics, social features, aesthetics, and recreation. Mathematics topics which make up the second dimension are communication, reasoning, numbers, measurement, patterns, functions/algebra, geometry, probability/statistics, and discrete mathematics.

The matrix is to be a starting point for new curriculum ideas. There are two natural approaches: examining mathematical strands for cultural application and examining cultural phenomena for mathematical aspects.

2.20. *Are There Revolutions in Mathematics* by Paul Ernest

Ernest begins with a detailed account of Kuhn's theory of scientific revolution, according to which, scientific progress alternates between two periods. In one period, advancements are made by finding new applications of some dominant paradigm. In the second period, differing paradigms clash until a dominant paradigm wins out. This second period is known as a Kuhnian revolution.

Some scholars have argued that humanistic mathematics is a Kuhnian revolution. Other scholars, most notably Griffiths, argue that Kuhnian revolutions do not occur in mathematics because there can be no paradigm clash. For instance, non-Euclidean geometry and Euclidean geometry can co-exist because they are describing fundamentally different things.

Ernest notes that there have been many revolutions in the standards for mathematical rigor, and in how mathematicians approach proofs. He concludes that there can be Kuhnian revolutions in metamathematics and mathematical epistemology.

2.21. *On learning in the Mathematical Sciences: Statistics 200 as a Paradigm of Everything Wrong in Mathematics Education* by James M. Cargal

“Too many courses try to teach too much material too fast.”
(page 66)

Cargal states that the true test of any mathematics course is whether or not most of the students can remember its significant results six months later. He notes that many introductory mathematics courses don't achieve this goal. He then declares that he will analyze Statistics 200 with this goal in mind, as Statistics 200 epitomizes many of the problems that befall introductory mathematics courses.

Cargal states that in Statistics 200, students are often expected to learn far too much in far too little time. Noting that many of probability's results are counterintuitive, and that repetition is often necessary to drive ideas home, he proposes splitting probability and statistics into two separate courses.

Cargal also criticizes pretentious mathematics professors who are unable to solve basic probability problems, yet insist doggedly that their wrong answers are correct.

Furthermore, based on his observation that when teaching introductory concepts in statistics, most teachers use very little of the probability theory that constituted the bulk of the course material up to that point, Cargal also proposes removing the probability material from Statistics 200 curricula.

2.22. in fin ity by Bonnie Shulman

This is a poem by Shulman, from the University of Colorado, exploring the concepts of “nothing”, “something”, “infinitely small;”, and “infinity”, emphasizing the counterintuitive beauty of infinite sums.

2.23. A Fairy Tale: Being A Pseudo-History of Mathematics With Special Attention Given to The Evolution of the Number System (which humanistic professors of mathematics tell their students under the illusion that this will turn them into humanists by Peter Flusser

This is a humorous retelling of how the number system evolved, done in a quirky style that is both biblical and ironic. Flusser describes mathematics as a continual overcoming of, in his words, “BURDENS AND IMPEDIMENTS”, culminating in the discovery of imaginary numbers. Flusser then mocks the increased abstractualization of mathematics that occurred after the discovery of non-Euclidean geometry. He states that humanistic mathematics is a response to this development.

3. Issue 9, February 1994. ISSN 1065-8297

The cover of [this issue](#) features diagrams that appear in G.S. Monk’s article, “Students’ Understanding of Function in Calculus Courses”, which is republished in this issue of HMNJ, see Section 3.6. The diagrams illustrate “pointwise” and “across-time” understandings of functions.

The editorial staff remained the same in this issue. The editor was Alvin White (Harvey Mudd College), and the associate editors were Harald Ness (University of Wisconsin Cetner) and John Haack (University of Iowa).

This issue is a good deal shorter than #8, spanning only 42 pages compared to the 76 of the previous issue.

The overwhelmingly educational bent seen in Issue #8 is less strong here, instead containing several pieces that think deeply about the philosophy of

mathematics as a whole. Still the majority of the pieces are about improving mathematics education. Notably, several articles focus on mathematics at the primary and secondary schooling level, which was absent in Issues 7 and 8. There are no pieces strictly on how to make mathematics more appealing in the public eye.

3.1. Letter from the Editor by Alvin White

As is usual for his letters from the editor, Alvin White summarizes a few choice articles that appear in the issue and mentions that “Students’ Understanding of Function in Calculus Courses” by G.S. Monk (see Section 3.6) is a republication of the original piece from Issue #2, 1988, so that the piece can reach a wider audience than it did six years ago.

3.2. Letter to the Editor by Ken Ross

Ross reflects on ‘The Einstein Effect’, where many feel like they must be geniuses to be good at mathematics, unlike the attitudes towards reading or writing. Did people feel this way before Einstein was famous, he wonders.

3.3. The Language of Mathematics: A Quantitative Course for a General Audience by Stephanie F. Singer

Singer describes a class, called The Language Of Mathematics, that was successful in engaging students who did not consider themselves good at mathematics. This article has the effect of presenting an example of mathematics as presented in a very humanistic way.

“The purpose of this article is to convince anyone with the inclination to design a mathematics course for a general audience that it’s worth the effort and to provide some concrete examples of successful activities and assignments.” (page 1)

Many of the class discussions and activities had a linguistic aspect, such as investigating true definitions of often-used terms or exploring the ability of number manipulation to fool consumers.

3.4. *Writing Mathematics* by E.G. Bernard

Bernard is a member of the faculty from [Marc Garneau Collegiate Institute](#), a high school in Toronto, Canada, hosting the Talented Offerings for Programs in the Sciences (TOPS) program, a selective math, science and English enrichment program.

In this article, Bernard writes about his experiences giving “mathematics writing” assignments to students who had just learned fractions, challenging them to first recall the story of Cinderella, then having them write a story describing the difference between adding and multiplying fractions. He asserts that it is important to grade students’ knowledge based on multiple criteria and ways of knowing. Mathematics should be taught holistically and have the difficult points addressed when the whole story has been told.

“One very important method of learning in the humanities involves a student asking questions prior to commencing a topic, and then having his own questions answered during his readings.”
(page 7)

3.5. *Mathematics and the Arts: Taking Their Resemblances Seriously* by Frederick Reiner

Reiner is a member of the faculty at The Key School, a K-12 coeducational independent school in Annapolis, Maryland. Here, he discusses at length and in detail the similarities and differences between mathematics and art, focusing on the many theories about the underlying nature of each, and poses ideas on how the resemblances between these two, whether superficial or indicative of something as grand as human nature, can aid in the philosophy of both.

“if we claim mathematics to be an art by entailing properties X, Y, and Z, are we prepared to counter the charges that with regard to art itself, X is irrelevant, Y is insufficient or Z actually antithetical? Do we know what art is any more than we know what mathematics is?” (page 9)

Reiner discusses how philosophical theories of art—realism, expressionism, formalism, and non-essentialism—can be applied to mathematics. In particular, in a way analogous to the distinction between aesthetics and art, we

may also make a difference between mathematical aesthetics and mathematics proper.

3.6. Students' Understanding of Function in Calculus Courses by G.S. Monk

This paper is a study on student responses to two questions on a final examination in a calculus course, and how these two questions show that students have a solid understanding of the “pointwise approach” to understanding functions but not the “across-time” approach, a problem that is educators’ responsibility to resolve. In particular the author states that there are two main ways of understanding functions: pointwise, which is illustrated by tables and numerical values and is the way most students are introduced to the concept of a function in their textbooks; and across-time, which considers how change in one variable affects others and is the way most texts and in-class exams assess understanding of functions. Students show much higher proficiency in pointwise than across-time, and a pointwise understanding seems to be a prerequisite for an across-time understanding.

This article was reprinted from the second issue of the Journal dated March 1988.

3.7. Mathematics for Math Majors: Loss of Self-Esteem by Fung Chun-Ip and Siu Man-Keung

Both authors are professors of mathematics at higher education institutes in Hong Kong. They aim to make mathematics education more accessible to students who find themselves disillusioned in their undergraduate studies.

They start by pointing out that mathematics majors are discouraged and estranged by the difficulty of the material and its disconnect from previous material.

“Students lack a global view of the subject of mathematics and rarely appreciate or enjoy it from a cultural aspect, and too little emphasis is put on the subject’s own worth.” (page 29)

Then they call for education to not only focus on the technical aspects of math but also on the cultural aspects.

3.8. *Philosophy of Mathematics, Mathematics Education and Philosophy of Mathematics Education* by Zheng Yuxin

Zheng is a member of the Department of Philosophy at Nanjing University in China. They identify themselves in the article as a “philosopher of mathematics”. Zheng’s main questions are:

“Is there any important relationship between the philosophy of mathematics and actual mathematical activities? Does the philosophy of mathematics have any important influence on actual mathematical activities?” (page 32)

Zheng analyses the role of philosophy of mathematics on the changes that have occurred in American mathematics education, as well as how to develop ‘philosophy of mathematics education’ as a field, and by extension, advance philosophy of mathematics and philosophy both. Mathematics education in America has shifted from “ignorant majority, high-level minority” to broad mathematical knowledge for all students. The article also describes the current mathematics education philosophy in China, which consists of the theory of mathematics curriculum, the theory of mathematics teaching, and the theory of mathematics learning.

3.9. *Poems* by Lee Goldstein

Two poems by Goldstein are included. They are free verse, and focus on the natures of symbolism and imagination, using the language of mathematical proof.

3.10. *Space Venture* by Edward Chipman

This is a poem composed of five eight-line stanzas, describing humankind’s desire to know space, and Chipman prays that the desire for knowledge also looks within.

4. Issue 10. August 1994. ISBN 1065-8297.

The cover of [this issue](#) is the Tree of Knowledge from d’Alembert’s seminal work *Discours Preliminaire*. It appears in Brown’s article “Applied Mathematics Should Be Taught Mixed” (see Section 4.2). It represents the coming-together of diverse strands of mathematical knowledge, and is equated with humanistic mathematics in Brown’s article.

This is again a shorter issue, of 42 pages without the front and back matter.

4.1. From the Editor by Alvin White

White notes that humanistic mathematics has become well-defined, and that for the first time mathematicians are beginning to flesh out the implications of that definition. He describes some important articles from this issue and some recent conferences on humanistic mathematics.

4.2. Applied Mathematics Should Be Taught Mixed by Gary I. Brown

Brown argues that the strict separation of pure mathematics and applied mathematics is misleading and patronizing towards pure mathematicians. He states that he will adopt concepts from mixed mathematics, the historical predecessor to applied mathematics, for his vision of how to teach applied mathematics humanistically.

Famous mathematician and thinker D'Alembert defines pure mathematics as the application of deductive reasoning to the study of the metaphysical, and mixed mathematics as the application of deductive reasoning to the study of the physical.

Brown concludes that pure mathematics refers to the development of mathematical theories, and that applied mathematics refers to the use of these theories to solve everyday real-world problems. In other words, math is about deducing facts from basic principles of experience and reality, and that thus pure and applied mathematics are actually united as one in mixed mathematics.

4.3. Female Voices in Mathematics: a New Course by Shobha Gulati

Gulati describes a course she developed in which students learn about significant female mathematicians. The students discuss the barriers to mathematics education that women have historically faced, and the ways in which these barriers persist today. The class begins by analyzing psychological accounts of sex-based differences in math performance. Next, students look for examples of subtle sexism in mathematical literature, with an emphasis on children's textbooks. After only a week, students already become more aware of discrimination against women in mathematics classrooms. This demonstrates the effectiveness of the course. In the second part of the class, students learn about famous female mathematicians and of historic barriers

to women's participation in higher education. They then discuss the glass ceiling that exists today.

4.4. MATH: It's Not Just a Four Letter Word by Susan Byerly

At first, Byerly was apprehensive about taking advanced mathematics courses. Then she did an independent study on ethnomathematics, and fell in love with mathematics. She concludes that there is much more to mathematics than just numbers, and discusses some ways in which ethnomathematics can be incorporated into the classroom.

4.5. Poetry by Helen Lewy

Lewy pens several humorous rhyming poems comparing mathematics to housework.

4.6. Mathematics in Literature and Poetry by Joanne S. Growney

Growney notes that mathematics students often feel as though their major is isolated from other fields. She then asserts that incorporating literature and poetry into a mathematics lesson can alleviate this sentiment.

4.7. What Changes Should Be Made for the Second Edition of the NCTM Standards? by Zalman Usiskin

Usiskin describes the importance of the NCTM Standards for elementary mathematics education. He discusses the possibility of a second edition being published. He supports this because, according to him, without a second edition, the Standards will die off and be forgotten.

Usiskin indicates that as society advances, so must the Standards. He observes that many educators misinterpret certain sections of the Standards, and that these sections ought to be rewritten for improved clarity. He speculates that there may be errors in the book which need to be corrected. Finally, he argues that educators need to know what to do after they have finished implementing the recommendations of the current edition of the Standards.

Along the way Usiskin point out specific ways the Standards must be improved. In particular he asserts that procedural mathematics ought to be recognized as an aspect of mathematical learning in the second edition of the Standards. He further notes that the Standards provide weak guidance for

mathematics educators in grades 3-6, and proposes looking to other countries' educational systems for ideas. He also suggests expanding the current curriculum in the Standards for grades 9-12 to grade 8.

Usiskin also states that the second edition of the Standards needs to give greater leeway to the learning needs of students because not all students learn at the same pace. He believes that the second edition of the Standards should lend greater credence to the role of deduction in mathematics. He declares that the second edition of the Standards must address the use of technology in mathematics education and advises the authors of the teaching components of the Standards to take into account traditional educational practices. Finally, Usiskin encourages the writers of the second edition of the Standards to include multiple options for constructing an acceptable curriculum.

Usiskin also states that grading needs to be more impartial, and also that traditional tests are ill-fitted to the current pedagogical paradigm for mathematics. He also notes that sometimes it is not the system that needs to change, but the students themselves.

4.8. NCTM Standards, Second Edition: a Review and Commentary on Usiskin's Address by Harald Ness

Ness summarizes the key points of Usiskin's article (see Section 4.7), and articulates several disagreements he has with Usiskin's position.

4.9. Epsilon and Delta: a Little Love Story by Bonnie Shulman

This is a humorous poem in which a student drifts off during math class and dreams about the marriage of epsilon and delta. Shulman subtly weaves some properties of continuity and convergence into her poem.

4.10. Humacrostic by Stephen I. Brown

This is an acrostic poem for the phrase "humanistic mathematics". Brown posits that humanistic mathematics is an awareness of the cultural evolution of mathematical thinking.

5. Issue 11, February 1995. ISBN 1065-8297

The cover of [this issue](#) is an illustration of Achilles and the tortoise from Sandra Keith's poem, *And this is the Tale that Xeno Told*, see Section 5.13. The tale illustrates convergence of infinite series.

The editor is Alvin White (Harvey Mudd College). The number of associate editors has increased from two to nine. They are Susan Addington (California State University, San Bernardino), Stephen Brown (SUNY Buffalo), JoAnne Growney (Bloomsburg University), Joel Haack (University of Northern Iowa), Sandra Keith (St. Cloud State University), Richard Montgomery (Southern Oregon State College), Harald Ness (University of Wisconsin Center), Frances Rosamond (National University, San Diego), and Gian-Carlo Rota (Massachusetts Institute of Technology).

This issue is again 42 pages, pointing toward some sense of standardization in the journal.

Topics that are touched upon in the issue include building of successful curricula, examples of humanistic mathematical education, and mathematics and spirituality.

5.1. Letter from the Editor by Alvin White

White reflects on the role of this journal and the ideas coming forth from it in math reform.

5.2. Letter from the Production Manager by Michelle Ivey

A perspective from a chemistry major who worked as the production manager for the journal for three years.

“Humanistic mathematics is teaching mathematics as a human creation, and therefore subject to the prejudices and whims of the people involved.”

5.3. In memory of Stravos Busenberg by Mario Martelli, Graeme Wake, Courtney Cleman, and Melissa Aczon

Stravos Busenberg was a professor of mathematics at Harvey Mudd College, who passed away the previous year at the age of 51. Shortly before this issue, 200 colleagues, collaborators, and friends came together at a conference on the Harvey Mudd campus to commemorate his life, and had discussions about mathematics, mathematical biology, and other topics that he was passionate about.

The four pieces published here are by his colleagues, friends, and students, mourning his passing and sharing his brilliance and presence in their lives.

5.4. *Poetry* by Lee Goldstein

A collection of free verse poems by Lee Goldstein, using mathematical concepts to reflect on topics such as like/dislike, the beginning of mathematics, and chaotic thought.

5.5. *A New Start for College Mathematics; Or Mathematics' Greatest Hits* by Harald M. Ness

Ness reflects on a successful mathematics program for liberal arts students developed by COMAP (Consortium for Mathematics and its Applications) and the subsequent development of an accompanying textbook.

Current mathematics curriculum is likened to a long, dark tunnel with no connection to outside culture.

“The current curriculum . . . gives the impression that time has stood still since the eighteenth century . . . It gives them no knowledge of the large variety of modern applications of mathematics.”
(page 6)

The new curriculum stresses breadth of topics and mathematics in culture (as opposed to mathematics for mathematics' sake).

The author wishes to remove the artificial barriers that separate the different “branches” of mathematics. They are intertwined and support one another.

5.6. *Missing Dimensions of Mathematics Instruction* by Walter Meyer

Meyer is a member of Adelphi University and was mentioned in the previous piece as the director of the project to create the textbook *Principles and Practice of Mathematics*. This article is a slightly edited version of his original proposal paper for the new curriculum.

Dimensions missing from current education include: mathematics as an element of culture, mathematics as a social experience, hands-on approach, student interests/experience, and mathematics as a story.

Why add dimensions to an already difficult field? Because separating mathematics from culture gives mathematics a bad image. Mathematics is about craftsmanship instead of the emotion (and occasional chaos) that comes from sharing it with society. He suggests being explicit to students about how radical current taken-for-granted ideas are.

5.7. *To Stephen W. Hawking* by Lillia N. Apostolova

This is a poem translated from Bulgarian, addressed to space-time and asking about its nature.

5.8. *The Study of Mathematics and Growth in the Spirit* by Rosemary Schmalz, SP

Schmalz discusses the similarities between mathematics and spirituality.

“I propose that the doing of mathematics can influence the human spirit, that the wholehearted study of mathematics develops those disciplines which facilitate spiritual growth.” (page 14)

She proposes that the study of mathematics encourages the growth of disciplines which are also important for growing on a spiritual path.

Another commonality she points out is that intuition is very important to both mathematics and spirituality, and discipline leads to flashes of intuition.

Mathematicians as well as spiritual leaders often have sudden conversion stories.

“Uselessness”, prayer/concentration, detachment are also described as common factors between mathematics and spirituality.

5.9. *Poetry* by Jonathan Post

A collection of poems by Jonathan Post, many of which engage in wordplay relating directly to the mathematical concept (such as pi, e, etc.).

5.10. *Some Notes on How Students Perceive Mathematics* by Joan Countryman

Countryman offers some thoughts from students who were taught that math had only known answers and was not supposed to fun—in other words, lacked humanity.

“When the mathematics that we teach is real our students will perceive its humanity.” (page 26)

5.11. *Poetry* by Monte J. Zerger

A selection of short poems about concrete mathematical concepts.

5.12. *Writing Assignments in an Abstract Algebra Course* by Krystina K. Leganza

Leganza provides three examples of writing assignments in intermediate-level mathematics courses and discusses the results and challenges of such writing assignments. The students have chances to correct and rewrite the mathematics, allowing them to concentrate on the writing portion.

5.13. *And This is the Tale that Xeno Told* by Sandra Z. Keith

A story-poem that tells the tale of Achilles and the tortoise. It should be noted that most mathematicians believe that the related paradox of Xeno can be explained via the convergence of an infinite series. An illustration of this story graces the cover of this issue.

5.14. *An Answer to our Liberal Arts Dilemma* by Bruce Williamson

Williamson discusses a course offered at the University of Wisconsin River Falls. It is structured around the question “What is mathematics?” Mathematics is described as a study of patterns, an organized body of knowledge, an art form, and a tool.

5.15. *Human Values and Science, Art & Mathematics* by Cindy Cichy

This is a reflection on *Human Values and Science, Art and Mathematics* by Hugh G. Lieber and Lillian R. Lieber. It seems to be written in the style of the original book, with each clause on a different line, similar to free verse poetry.

5.16. *Reaction to HUMAN VALUES, SCIENCE AND MATHEMATICS* by Lillian R. and Hugh Gray Lieber by Jeanette Nelson

This is another reflection-imitation of *Human Values, Science and Mathematics* written from the point of view of someone who views themselves as someone who knows very little of mathematics.

5.17. *Math Puzzler: Letter Division* by Paul J. Tobias

These are some mathy puzzles where letters are used in place of numerals and the reader is supposed to solve for each letter. Answers are provided on the next page.

6. Issue 12. October 1995. ISBN 1065-8297.

The cover of [this issue](#) consists of two beautiful irregular spiral tilings. They represent the point at which mathematics and the arts come together in harmonious matrimony. They are featured in James E. Hall's article in this issue, see Section [6.4](#).

The editorial team remains the same with one addition to the rank of associate editor: Julian Weissglass of the University of California Santa Barbara. This issue is 46 pages, slightly longer than some of the most recent issues, but still in the same range.

6.1. Invitation to Authors by Alvin White

White invites the readers of the journal to submit articles and poetry to the journal for publication, and provides instructions on how to submit material for publication.

6.2. From the Editor by Alvin White

White describes a handful of the most noteworthy pieces which appear in this issue.

6.3. Voices From the Reform Movement by Allyn Jackson

In commemoration of their 40th anniversary, the Exxon Education Foundation asked Allyn Jackson to speak to people involved in the educational reform movement in order to capture the current state of the national debate. Modern students' mathematics education consists mostly of rote memorization of calculatory procedures. However, technology is making these skills obsolete, and as a result American graduates who use mathematics in their careers are falling behind their international counterparts.

Jackson discusses the success of the NCTM in building a network of mathematics educators, industry professionals, and governmental agents dedicated to the promotion of humanistic mathematics. She highlights the importance of a national conversation about mathematics education reform and encourages mathematicians to participate in the conversation.

Although awareness of the Standards is growing, many teachers still aren't making efforts to implement their recommendations in their classrooms, especially at the elementary level. Jackson argues that teachers need freedom

and encouragement in order to develop their own strategies for implementing the Standards in their classrooms. She identifies standardized testing as a major obstacle to implementing the Standards and discusses some prototypes for new forms of testing.

6.4. Tilings in Art and Science by James E. Hall

Hall lambastes the increasing cultural distance between scientists and humanists. However, he points out, the two disciplines are quite close thematically. It is human nature to search for meaning, pattern, and order where there might at first appear to be none. Hall argues that tilings are a demonstration of this uniquely human characteristic. He also argues that tilings breach the gap between humanists and scientists, as they are a mathematically regular form of art.

6.5. Mathematics as an Aesthetic Discipline by J.D. Phillips

Phillips plans to defend the discipline of mathematics to those humanists who see it as little more than rote memorization of formulas. He begins by pointing out that although this may be an accurate depiction of elementary mathematics education, it is not an accurate depiction of mathematics on the whole. Mathematics is commonly defended as being practical, but with the exception of engineers and physicists, very few people use anything more than basic arithmetic in their daily routine. As a result, most people find this argument very unconvincing.

Phillips argues that mathematics is beautiful because of its austere, economical precision. Phillips also argues that mathematicians experience their work as an artist would. Overall, Phillips asserts that the study of great ideas is always worthwhile. He goes on to describe many great mathematical ideas. His implicit argument is that mathematics should be studied because there are many great mathematical thinkers.

6.6. Mathematizing by Lee Goldstein

This is a very brief poem about the blossoming of mathematical knowledge outwards from its foundations.

6.7. *The Questionable Probability Theory Behind the Strange Story of THE BELL CURVE's Bell Curve* by Miriam Lipschutz-Yevick

Lipschutz-Yevick accuses Murray and Heinstein's controversial book *The Bell Curve* of being sloppy and statistically inaccurate, and demonstrates the mathematical invalidity of their analysis.

6.8. *A University Mathematician's View of What's Wrong With University Mathematics Education* by Reuben Hersh

Hersh criticizes the view of mathematics courses as being nothing more than preparation for other, more advanced courses. He also examines how graduate education leads to most teachers developing an overly dogmatic teaching style. He blames mathematics departments for not paying more attention to student evaluations and also criticizes the mathematics' pro-pure bias. Finally he criticizes the reform movement for being overly focused on curriculum.

As a solution to the problems he has identified, Hersh proposes separating mathematical research and mathematical education into two different professions. He also proposes changing the views of those in power and points out that revolution is impossible without a collective effort.

6.9. *"Modern Mathematics" at Sonoma State University* by C.E. Falbo

Falbo describes a course that he taught at Sonoma State University called "Modern Mathematics". The class has many special-admit students. These students were learning-disabled, and thus given extra assistance with the course. As long as these students worked hard, they succeeded, albeit with some unfortunate exceptions. Falbo describes a methodology he developed to determine which special-admit students were severely learning-disabled. However, this methodology was only partially effective. He compares this course favorably to the Sloan Foundation's New Liberal Arts program.

6.10. *Book Review: Introductory Algebra: a Just in Time Approach* by Gayle Smith

Gayle Smith adores this text, which is written for remedial algebra courses at community colleges. She appreciates that the book is contemporary with the Standards, that the book is written in an informal style, and that the

book uses a variety of different instruction techniques so that it can appeal to every learning type.

6.11. Reflections by Alice Kaseberg

Kaseberg describes her philosophy behind writing the book *Introductory Algebra: A Just in Time Approach*, reviewed in the previous article. She wants students to be able to think for themselves, and believes that the extensive visuals throughout the book contribute to creating a humanistic learning environment.

6.12. Letter Division by Paul J. Tobias

Tobias presents some more fun math puzzles in which long division equations are given with all the numbers replaced by letters! The reader must figure out which number each letter stands for. (See Section 5.17 for similar puzzles from the previous issue.)

6.13. The Most Humanistic Mathematician: Florentin Smarandache by Jo-Anne Growney

Growney provides a brief overview of the works of Florentin Smarandache. He is the leader of the paradoxist movement, and is known for his playful mathematics and mathematical poetry.

6.14. Poem in Arithmetic Space by Larry Seagull

Seagull presents some beautiful, mathematically interesting sequences, and then discusses Smarandache paradoxist numbers.

6.15. Haiku by Frances Rosamond

Rosamond presents a dense, abstract haiku. She describes her haiku as a tale in which modern students learn about the great mathematical thinkers of the past. She explains the symbolism in her haiku.

6.16. Attitudes of Students to Independent Learning by S. Kenneth Houston

Houston included an independent study component to his mathematics course which emphasized learning from texts and interacting with peers. Students' responses were extremely negative, and hence he tried to develop an improved version. The second time around the students were more pleased, but admitted to falling behind on the reading. At the end of the semester, Houston asked the students to write an essay on independent learning. Many complained about laziness, about lack of motivation, and about feeling dependent upon teachers. Some of the students felt hampered by a competitive learning environment.

6.17. Solutions to Letter Division by Paul J. Tobias

These are the solutions to Tobias' clever puzzles which appeared earlier in this issue, see Section [6.12](#).

7. Issue 13, May 1996. ISBN 1065-8297

The cover of [this issue](#) is an illustration from Frank J. Swetz's "The Mathematical Quest for the perfect Letter", which shows a 15th century calligrapher using geometry to construct "perfect letters". The article is included in this issue of the Journal.

The editorial staff remains the same. The editor is Alvin White (Harvey Mudd College) and the associate editors are Susan Addington (Cal State University, San Bernadino), Stephen Brown (SUNY Buffalo), JoAnne Growney (Bloomsburg University), Joel Haack (University of Northern Iowa), Sandra Keith (St. Cloud State University), Richard Montgomery (So. Oregon St. College), Harald Ness (University of Wisconsin Center), Frances Rosamond (National University, San Diego), Gian-Carlo Rota (Massachusetts Institute of Technology), and Julian Weissglass (University of California, Santa Barbara).

This issue contains several articles that link mathematics to other fields, such as typography, poetry, and monasticism, with no reference to integrative curricula. Several articles deal with the role that technology plays in mathematics education. Most of the articles that deal mostly with education have a focus on making courses for non-major students, as well as integrating the role mathematics has in culture or history into the course.

This issue is also 46 pages, like the previous one, without counting front and back matter.

7.1. From the Editor by Alvin White

This issue celebrates the tenth year of the Humanistic Mathematics Network Journal. White brings the reader back to the beginning of the journal, when thirty mathematicians came together to discuss humanistic mathematics. Humanistic dimensions of mathematics include:¹⁰

- An appreciation for the role of intuition,
- An appreciation for the human elements that motivate discovery (competition, curiosity, competition, etc),
- A understanding of the role of value judgments in mathematics as an academic discipline,
- Recognition for the need for new approaches to teaching and learning.

White also announces that the journal will now include a comments and letters section.

7.2. The Mathematical Quest for the Perfect Letter by Frank J. Swetz

This article follows various influential figures in the history of lettering and tells a detailed history of mathematically inclined typography.

Geometric designs and fixed proportions have been present in typography since Pythagoras. For instance, the ratio 10:1 and circle-square relations intersect in da Vinci's "Vitruvium Man", among other things. Graphic design was purposefully associated with the proportion and symmetry of the human form.

Following the 17th century, there were a few efforts to obtain perfect letters, until the advent of digitization and photocomposing prompted Donald Knuth (Stanford University) to mathematically design the "perfect letter". He used axioms of aesthetic pleasure to create curves that would form letters, and created a program called METAFONT that could be tweaked by the user to achieve a personalized but still mathematically perfect letter.

¹⁰ These points are much less education-focused than the "from Newsletter #1" (see Section 1.1) that was featured in issues 1-7.

7.3. On Mathematics in Poetry by John S. Lew

Many poems of mathematics either play games with mathematical jargon or express wonder at mathematical beauty. Lew bemoans the lack of integration between mathematics and the larger world, citing the poems of John Donne as a rare example of poems that do. He also supplies a poem of his own that illustrates his point. The poem draws on metaphors in astrophysics to depict human relations.

7.4. Announcement: 2nd European Congress of Mathematics

An invitation for readers to attend the 2nd European Congress of Mathematics in Budapest in July 1997. This advertisement shows that the Journal has become widely read enough for it to be a way to spread information amongst mathematicians.

7.5. Personal Reflections on Mathematics and Mathematics Education by Lynn E. Garner

Garner, a professor at Brigham Young University, gives a reflection on her life experiences learning and teaching mathematics, and reflects on the process that students need to be able to understand mathematics the way it should. After getting a PhD in mathematics and starting to teach at the undergraduate level, Garner was frustrated by the lack of room the undergraduate texts had for the problem-solving questions that had encouraged her to become a math major in the first place. She eventually started discussing the true nature of mathematics with others.

“We didn’t really know what mathematics was, beyond the fact that it was what mathematicians did.” (page 12)

Mathematics is not purely a description of the “real world”, neither it is merely a mental game that is removed completely from the physical universe. In the 1970s-80s, mathematics class enrollment skyrocketed and departments scrambled to find resources. Many students did not pass the courses. With the introduction of the graphing calculator in 1988, mathematics education changed and Garner changed with it. Students were now free to focus on interpreting and understanding graphs instead of merely producing them. In 1991, she began using the Harvard calculus textbook composed of problem solving; the new class she taught was full of enthusiasm and group work.

“A “real world” problem presented itself and the tools of logical analysis were applied to it. Assumptions were made about the problem to make it more tractable, and order arose out of the assumptions. Techniques were developed for handling the order and drawing from it a prediction about the situation. The entire process was called mathematics . . . It has been forgotten that mathematics is every bit as much a process as it is a body of knowledge.” (page 15)

Students need to work socially in mathematics. And instructors should use technology to represent ideas and ease experimentation, but not to “black box” concepts.

7.6. Mathematician by Sherman K. Stein

A poem about the thought process of the mathematician and her adventures in thought-space.

7.7. Symmetry: A Link Between Mathematics and Life by Catherine A. Gorini

Gorini teaches at an institute named after the great yogi Maharishi Mahesh, the Maharishi University of Management. She incorporates elements of spirituality and life philosophy into her mathematical teachings.

Gorini points out that symmetry is pervasive in mathematics, from elementary to advanced theory. People also find themselves interested by examples of symmetry in the real world, so it is a worthwhile topic for general education students to explore. Metaphor of transformation as “action” and invariance as “inaction” ties symmetry to philosophy and religion.

7.8. Life Math by Kathy Hayes

A poem that uses mathematical symbols in place of certain words.

7.9. Monasticism and Mathematics by John F. Loase

Loase is a professor at SUNY Westchester Community College. He contends that mathematicians have a good deal in common with monastics. In particular he points out four basic commonalities: Asceticism, being cloistered,

belief that money causes debasement, and embracing paradox. He suggests that it is important to understand and be compassionate about the shadow world that monks and mathematicians live in, far from the real world; the real world problems they face are often not considered.

7.10. Announcement: 8th International Congress on Mathematical Education

A call for participants in the 8th International Congress on Mathematical Education

7.11. Gresham's Law: Algorithm Drives Out Thought by Sherman K. Stein

This is a talk from the 1987 AMS meeting, reprinted from Humanistic Mathematics Network Newsletter #1. It is based off of Gresham's law of economics: "Bad money drives out good money. Copper drives out silver; silver, gold."

Mathematics curricula focus on topics rather than thinking skills. Algorithms are good and should be taught but they are not the end goal. New textbooks fail to fulfill the standards set by state commissions, which say that mathematics should encourage thought and the formation of hypothesis. Tight scheduling and paced syllabi discourage teaching of "thought" over "algorithm". Traditional problems can be recast over an open field—to make the student experiment and conjecture rather than being aware of the truth and working goal-wise to prove it.

7.12. Socrates and the Nonslave-boy by W. M. Priestley

This piece is a personal anecdote by Priestley, a professor at University of the South. He seeks to recreate Socrates' tale of educating a poor slave boy and leading him to recognize a mathematical truth (Gauss summation). The boy failed to understand, to the frustration of the teacher, but eventually the teacher, who is the boy's father, remembers the importance of having fun and of discovery, and embraces the boy's understanding of N as the letter before O, rather than as a placeholder for numbers. The tale warns against compulsive teaching.

7.13. Using Mathematics Courses in Support of Humanities in a Liberal Arts Curriculum by M. S. Jagadish

Jagadish is a professor at Barry University. Here, Jagadish gives an example of how to create a liberal arts general mathematics curriculum that focuses on the role of mathematics in culture.

Mathematics is no longer considered an integral part of culture in mass education. Some attempts to humanize mathematics have offered courses that are “relateable”, but still do not dwell on cultural values. Jagadish offers examples of topics that can be taught in this sort of course, including Mathematics and the Arts, Euclidean and Non-Euclidean Geometries, and Probability. In particular there is much value in teaching the history of mathematics.

7.14. Announcement: J. Paul Getty Undergraduate Internships

An announcement of a ten-week summer internship program for students interested in applying their math and science knowledge to the arts.

7.15. Multicultural Mathematical Ideas: a New Course by Bernadette Anne Berken

Berken, a professor at St. Norbert College, talks about her experience in creating a course for the Middle School Mathematics Minor Certification Program. The course is called Multicultural Mathematical Ideas, and examines mathematics from past and present cultural settings.

The course was born in a meeting that focused on the issue of the dominance of white male Eurocentric perspective in science education. As a result the class focuses on non-Western perspectives in mathematics, including topics like counting systems, art, and games.

7.16. X-ette by Lee Goldstein

An anthropomorphic poem about x and its place in mathematics.

7.17. Ode to Numbers by Pablo Neruda

A poem that celebrates mathematics and numbers as an object of wonder in nature.

7.18. Mixing Calculus, History, and Writing for Liberal Arts Students by W. M. Priestley

Priestley is a professor at the University of the South and discusses the development of a calculus course for humanities students with low math scores.

“By forcing students to learn how to write mathematics, they will inadvertently learn how to *read* mathematics.” (page 39)

“My experience has been that this indirect approach of finding wrong answers, in order to eliminate them from consideration, is attractive to students, particularly to students in the humanities who have never before realized that we are doing good mathematics if we have a method for proving that an answer is wrong.” (page 40)

Priestley’s main thesis is that mathematics is in fact part of the liberal arts and has been for 2500 years, and that it would be worthwhile to use this approach earlier in education in order to not deter students from mathematics for life.

This is Priestley’s second article in this issue, also see Section [7.12](#).

7.19. Humanistic Mathematics and the Internet: the Ugly, the Bad, and the Good by Ruth Guthrie and Judy Guthrie

Ruth and Jody Guthrie reflect on the positive and negative aspects of the availability of mathematics on the internet from a humanistic perspective.

The Ugly: The sheer volume of information available causes quality problems. “Perhaps high quality information will be obtained by subscription fees only.” (43)

The Bad: Technology creates a divide between those with access and those without. Also, technology makes discovery of knowledge more impersonal. Not to mention that the students can feel overwhelmed and lost, and therefore disconnected.

The Good: It provides a community for the student, a community with people with all levels of math knowledge, and can serve as a pathway to communication.

7.20. Mentalism by Lee Goldstein

A poem that uses spirals as a metaphor for like and dislike.

7.21. *A Prandial Dialogue on Abstract Algebra as an introduction to the Discipline of Mathematics for Liberal Arts Students* by Margaret Holen

Holen, from Princeton University, recounts an incident where she and another mathematics PhD student successfully convince an undergraduate liberal arts student to take an abstract algebra course in their senior year.

7.22. *Comments and Letters*

The comments section contains two responses to Reuben Hersh's article "A University Mathematician's View of What's Wrong With University Mathematics Education" in Issue #12 (see Section 6.8).

Judith Roitman from the University of Kansas disagrees wholeheartedly with Hersh. She expresses the belief that he is ignoring the many reforms and efforts to focus mathematics on group learning and exploratory projects.

On the other hand, Harald M. Ness, of the University of Wisconsin Center, agrees entirely with Hersh, saying that college math community is narrow minded and continues to teach mathematics with a content and method that seems to expect all students to be future mathematicians.

"The college math community needs to decide between very small departments that train only mathematicians and departments that offer core courses for all students and have their faculty versed in other disciplines where they can teach in or in cooperation with faculty in those disciplines that use mathematics extensively." (page 47)

8. Issue 14. November 1996. ISSN 1065-8297

The cover of [this issue](#) depicts a Rwandan drummer. Rwandan drumming and its relationship to mathematics is discussed extensively in Huylebrouck's contribution to this issue, see Section 8.6.

With its 52 pages, this issue is slightly larger than some of the preceding ones. However the editorial team remains the same.

8.1. Invitation to Authors by Alvin White

White invites the readers to submit their own material to the journal for publication. He goes over the formatting guidelines and submission instructions briefly.

8.2. From the Editor by Alvin White

White welcomes a new member to the production staff team. He then pays his respects to a colleague who recently passed away.

8.3. What's All the Fuss About? by S.K. Stein

Stein quotes some excerpts from a report which found that at a national level, calculus education is ailing. Even though this had not been the case in Stein's personal experience, he still felt discomfited by the report. Stein states that the fundamental question of any calculus or discrete mathematics course is

“what are we trying to do in calculus and discrete mathematics courses other than cover some definitions, facts, and algorithms?”

He proposes that college mathematics departments offer a discrete course for college freshmen to be taken concurrently with calculus. Stein also proposes that calculus courses include what he calls “open-ended” or “exploratory” questions, which encourage experimentation and independent work.

8.4. The Triex: Explore, Extract, Explain by S.K. Stein

Stein argues that the goal of education is to develop students' reading ability, writing ability, and most importantly of all, thinking ability. He then returns to his concept of “exploratory” problems fleshed out in the previous article. He says that these problems can be constructed by using an “explore, extract, explain” procedure. In “explore”, students are given an open-ended question. They consider a plethora of possible solutions and pursue a wide variety of different approaches to the problem. In “extract”, students derive the essential information needed for the solution from their exploratory work. In “explain”, students synthesize this information into a cogent proof. Stein provides some examples of this type of problem.

8.5. *Noesis* by Lee Goldstein

This is a brief poem which reflects upon the mathematical nature of communication as it pertains to love.

8.6. *Puzzles, Patterns, Drums: the Dawn of Mathematics in Rwanda and Burundi* by D. Huylebrouck

Huylebrouck introduces the reader to his themes and ideas by discussing a Pulitzer Prize-winning book (*Gödel, Escher, Bach: An Eternal Golden Braid* by Douglas R. Hofstadter) which highlighted the connections between Bach's compositions, Gödel's theorems, and Escher's tilings. From there, he moves on to his main topic.

Huylebrouck briefly describes the geography, demographics, and religious history of Rwanda and Burundi. Then he describes Igisoro puzzles. He then invites the reader to find a process for performing difficult multiplication calculations on an Igisoro board, noting that the procedure is similar to the Russian Peasant multiplication method. Then he traces the oral history of decorative geometric paintings in Rwanda and Burundi. He reflects upon the elegant simplicity and reflective symmetry that these paintings possess.

Next Huylebrouck introduces the reader to the sacred drums of Rwanda. The rhythms of these drums are governed by three principles, the hemiola effect, the additive rhythm constraint, and the Gestalt phenomenon. The hemiola effect occurs when multiple beats are performed simultaneously in a 2:3 ratio. The additive rhythm constraint allows beats to be broken up into uneven lengths as long as they sum up to a common length. The Gestalt phenomenon refers to the ability of the listener to pick out one line of rhythm from the complicated whole. Huylebrouck notes that these rhythmic patterns bear many similarities to traditional Mediterranean and Asian drumming practices.

Finally he presents a Hofstadter-esque dialogue between two Rwandans on the relationship between philosophy, mathematics, and drumming. They discuss many riddles.

8.7. *Music and Mathematics* by Roxanne Kitts

Kitts begins by explaining the difference between music and noise. Then she introduces the reader to Fourier analysis and the study of wavelets, two

advanced methods for studying musical sounds. She discusses harmonies and frequency ratios within the context of a brief story about Pythagoras. Finally Kitts develops a very rigorous, complex mathematical model for musical compositions and musical codes.

8.8. Book Review: EMBLEMS OF MIND, THE INNER LIFE OF MUSIC AND MATHEMATICS by Edward Rothstein by Sandra Z. Keith

Keith begins her comments with a note on the incompleteness and superficiality of the oft-stated platitude that music and mathematics are one and the same. She points out that Rothstein's book is focused primarily on drawings, analogies, and connections between the twin processes of discovery and aesthetic appreciation which inform both music and mathematics.

Keith tentatively compliments Rothstein's handling of music's emotional power, and yet criticizes Rothstein's exclusive focus on classical, baroque, and romantic Western music. She does acknowledge that sometimes Rothstein's musicological analysis can be overly dense.

Keith offers a summary of Rothstein's philosophical positions on the nature of beauty and the sublime and also comments on the nature of metaphor.

8.9. Book Review: EMBLEMS OF MIND, THE INNER LIFE OF MUSIC AND MATHEMATICS by Edward Rothstein by Dan Fitzgerald and Joel Haack

This is another review of the same book reviewed in the previous article. Fitzgerald and Haack state that the author of the text adopts an aesthetic, philosophical view of the relationship between mathematics and music. They note that Rothstein speaks at great length about the similarities between the inner life of mathematicians and the inner life of musicians. They claim that, according to Rothstein, both mathematics and music are the synthesis of absolute truth with untold beauty.

8.10. Mathematical Rebuses by Floren Smarandache

These are some mathematical puzzles by Floren Smarandache, dubbed "the most humanistic mathematician" by JoAnne Growney in an earlier issue, see Section [6.13](#).

8.11. *Fibonacci Melodies* by Robert Lewand

Lewand uses algorithmic Fibonacci composition to motivate some surprising theorems about Fibonacci sequences in modular arithmetic.

8.12. *Mathematical Rebuses* by Florentin Smarandache

These are even more mathematical puzzles by the one and only Florentin Smarandache.

8.13. *Book Review: ETHNOMATHEMATICS: A MULTICULTURAL VIEW OF MATHEMATICAL IDEAS*, by Marcia Ascher by Bernadette Berken

Berken addresses Ascher's focus on the mathematics of cultures that have been victimized by imperialism, such as the Navajo and the Warlpiri. Berken praises Ascher for arguing that the definition of "mathematics" is dependent upon cultural context, and for advising the reader to think beyond Eurocentric definitions of mathematics. Berken then discusses Ascher's book's topics chapter by chapter.

8.14. *Psychosis* by Lee Goldstein

This is a reflective poem about humanity's efforts to impose order on chaos in all aspects of life.

8.15. *The Folktale: Linking Story to Mathematical Principles* by Audrey Kopp

Kopp comments on the recent movement to unite literature and mathematics, especially within elementary mathematics curricula. Kopp notes that most of the stories which are used by this movement are modern, and were devised explicitly for the purpose of teaching children mathematics. Kopp observes that these stories often feel painfully contrived, and argues that traditional folktales may serve the same purpose. She gives some examples of traditional folktales that could be used to teach mathematics. Kopp concludes that folktales are a wonderful way to work mathematics into humanity's oral tradition.

8.16. Mathematical Rebuses by Floren Smarandache

These are yet more mathematical puzzles by the singular Florentin Smarandache.

8.17. On the Use of Intelligent Tutoring Systems for Teaching and Learning Mathematics by M.D.C. Mendes, M.G.V. Nunes, and C.A. Andreucci

The authors advise caution when developing educational technology, and note that often instructors will incorrectly assume that tutoring technology is a panacea for all of America's educational woes. Then the authors briefly describe ITS (Intelligent Tutoring Systems). These systems are designed for maximum adaptability to the needs of teachers and students. They are intended to assist instructors, not replace them.

The authors note that many students feel intimidated by mathematics. They also point out that even at the graduate level, many students still lack an understanding of essential concepts. Since more advanced mathematics build off of less advanced mathematics, this is indicative of the shoddy state of modern mathematics education at every level. The authors argue that in order for students to truly understand mathematical concepts, they must construct the ideas behind them independently. The authors identify some ways in which this process can fail. They claim that technology is now sufficiently advanced to be able to teach in this way.

8.18. Comments and Letters by R.B. Leipnik and Charles B. Tinkham

This section includes two letters.

in the first letter, Leipnik defines humanistic as "relating to 1a) classical letters, 1b) critical spirit, 1c) secular, 2) humanitarianism, 3) attitudes centering on human interests and values". He says that humanistic mathematics satisfies definitions 1b), 1c), and 3). He argues that environmental protection also satisfies some of these definitions, and that therefore what he calls "protective mathematics" is humanistic mathematics. He talks about job opportunities in protective mathematics.

In the second letter, Tinkham expresses disagreement with John Lew's interpretation of Donne's poem "A Valediction Forbidding Mourning", see [Section 7.3](#) for the relevant article.

8.19. *Coming in Future Issues*

This brief section lists some of the upcoming articles in future issues.

9. Issue 15, July 1997. ISSN 1065-8297

The cover of [this issue](#) shows the Andalusian Variation, a pattern from Islamic art that features symmetry. It accompanies Salma Marani's article "Illumination and Geometry in Islamic Art".

The editorial team remains the same. The editor is Alvin White (Harvey Mudd College) and the associate editors are Susan Addington (Cal State University, San Bernadino), Stephen Brown (SUNY Buffalo), JoAnne Growney (Bloomsburg University), Joel Haack (University of Northern Iowa), Sandra Keith (St. Cloud State University), Richard Montgomery (So. Oregon St. College), Harald Ness (University of Wisconsin Center), Frances Rosamond (National University, San Diego), Gian-Carlo Rota (Massachusetts Institute of Technology), and Julian Weissglass (University of California, Santa Barbara).

Interestingly enough, hardly any of the articles in this issue deals with teaching humanistic content in mathematics courses. A good few are concerned with humanistic methods, and the majority either apply mathematical methods to traditionally humanist fields (such as language or religion), or consider mathematics from a humanistic perspective with humanistic methods.

At 56 pages this issue is slightly larger than the previous issue.

9.1. *From Newsletter #1* by Alvin White

The letter from Newsletter #1 is reprinted in this issue, after not having been reprinted for the past few. See Section [1.1](#).

9.2. *From the Editor* by Alvin White

White talks briefly about the support of the Exxon Education Foundation and the widening circulation of the journal.

9.3. *What Kind of Thing is a Number?* by Reuben Hersh and John Brockman

This is an interview of Hersh by Brockman, about philosophy of mathematics and about teaching mathematics.

There are three schools of thought about math: Platonism (math is abstract magic independent of humanity), formalism (mathematics is rote calculations), and humanism (math is a part of human culture and history. It is internal to culture but external to the individual)

The essential thing to teaching humanistic math is interaction and communication. Let the students talk by stepping down.

Mathematical beauty is when something confusing or unclear becomes clear.

9.4. Math Lingo vs. Plain English: Multiple Entendre by Steven I. Brown

Brown is a professor at SUNY Buffalo, reflecting on the difficulty students find in reconciling mathematical use of words with their English uses.

Hersh said to Beware the Double Entendre, but Brown asks his readers to be aware of and appreciate the differences and connections between mathematical words and their everyday meanings.

“It is worth doing some analysis of words and concepts in ordinary language that *do not at all* have mathematical counterparts, but that strongly influence the way in which our students think about mathematics and mathematical development in the first place. *Progress* is one such concept but there are others.” (page 9)

Brown also touches on the concept of “definition”, which is often decried as being “arbitrary” by those who fail to see that definitions are not made arbitrarily and considerable work goes into deciding that a definition must be made. They are often descriptive, not prescriptive.

9.5. Abe Shenitzer at 75 by Hardy Grant

Grant’s article recognizes and celebrates Shenitzer for his humanistic approach to mathematics.

“Specialization is the price we pay for creative achievements...the ‘average’ productive mathematician sometimes knows little about mathematical ideas outside his specialty and even less about their evolution and role.” (page 12)

9.6. *A Brief Tribute to π* by J.D. Phillips

A short poem about pi.

9.7. *Reminiscences of Paul Erdős (1913-1996)* by Melvin Henriksen

A collection of facts and stories about mathematician Paul Erdős, by Melvin Henriksen, professor at Harvey Mudd College.

9.8. *Sand Songs: The Formal Languages of Warlpiri Iconography* by James V. Rauff

Rauff, a professor of mathematics at Millikin University, uses the systems of formal languages and formal grammars to analyze Warlpiri iconography.

The Warlpiri are a group of seminomadic hunters in Central Australia. They had an iconographic written language and sand stories that can be analyzed in terms of formal language theory.

Rauff first analyses sand story iconography, finding that it can be interpreted as a formal language. He clarifies that this does not speak about the nature of the language nor does it claim to be the way the Warlpiri view their language or the world. He also applies formal grammars to Yawalyu designs, which appear to women in dreams; site-path designs, which depicts ancestral routes; Guruwari, which are men's ancestral designs.

Is Warlpiri iconography mathematics? Kind of. It can be viewed as composed of finite building blocks with finite rules arranged to model reality. But they seem to lack a "theory of iconography" that abstracts general patterns. It is unclear.

"Mathematics includes a multitude of practices that are characterized by algorithms, formal processes, and abstraction. In this context, the Warlpiri iconography emerges as an ethnomathematical system." (page 26)

"European anthropologists...were looking for counting and arithmetic in Aboriginal cultural, but they missed abstract algebra!" (page 27)

9.9. *Book Review: THE CREST OF THE PEACOCK: NON-EUROPEAN ROOTS OF MATHEMATICS* by *George Gheverghese Joseph* by Bernadette A. Berken

Joseph eschews the traditional method of extreme bias towards Greek mathematics and subsequent Eurocentric views of mathematics, instead emphasizing development of mathematics from a variety of cultures.

“Joseph explores the mathematical development chronologically yet within the social, historical, and religious context of the particular culture. Further, he makes numerous connections among the various cultures so that the reader easily perceives the interactions that occurred between cultures and the process by which mathematical knowledge was transmitted and grew.” (page 29)

9.10. *Poetry* by Sascha Cohen

Sascha Cohen was at the time of writing a sixth grader at Hale Middle School in California. The poem was submitted by her teacher, Margaret Schaffer. The poem describes wonder at the geometric designs of a stained glass window.

9.11. *Al-Khawarizmi's Algebra: The First Paradigm in Algebra* by Murad Jurdak

Jurdak is a professor at the American University of Beirut in Lebanon. Here, he explores the origins and history of the algebraic system and makes some suggestions about modern algebraic education based on his historical observations.

A paradigm, as defined by Kuhn, is something that is shared by members of a scientific community, but it is also something that scientific communities form around and define themselves on. There are two general schools of thought regarding paradigm shifts in mathematics. Rationalist historians consider history as homogeneous growth of the unchanged axiomatic method. Fallibilists consider the growth of mathematics as a dialectical process where knowledge is restructured based on counter-examples to existing conjectures.

It is difficult, however, to argue for a paradigm in education in Kuhn's definition. There are, though, recognizable revolutions in education, the newest one being the revolution of technology.

Most mathematicians recognize Al-Khawarizmi's algebra as the beginning of a paradigm where there was none before, in the sense that there were now universally accepted generalizations within a certain scientific community.

Jurdak then discusses the contributions of Al-Khawarizmi's algebra to representation systems.

“Al-Khawarizmi's work marks an early and rare example in which the full cycle of a mode was achieved. The algebra of Al-Khawarizmi moved from identifying situations to modeling such situations by a mathematical system by applying the latter to a variety of situations much broader than the one with which he started.” (page 35)

The disconnect between arithmetic and algebra as well as natural language and algebra both pose difficulties for students. If we look at the historical development of algebra, we find that the first four centuries of algebra used natural language as its medium, and perhaps this is an approach worth returning to.

Jurdak also suggests returning to geometry as a way of representing algebraic ideas and remembering and algebra as conceived as a science and not a symbol system.

9.12. Illumination and Geometry in Islamic Art by Salma Marani

Marani, a member of the University of Texas MD Anderson Cancer Center, talks about the use of symmetry and geometry in Islamic art and how this can be used in education.

Tessellations and other geometric patterns are an integral part of Islamic art and architecture, and deeply inspired M.C. Escher, who says that he “tried to approach infinity as purely and as closely as possible.”

Marani explores in detail several often-used patterns in Islamic art and how they are constructed through symmetry and rotation.

“This process of creating unit cells and tessellations allows the student to explore ideas in transformation geometry with relative ease and since the results are interactively and visually generated a deeper understanding of the mathematical concepts! becomes possible.” (page 40)

9.13. *See-duction: How Scientists are Creating a Third Way of Knowing* by Howard Levine

Levine, a professor at the California College of Arts and Crafts, argues that we have entered a new era of scientific knowledge with the advent of computer modeling, and this revolution, as well as the ones before, are a synthesis of science and art.

“Not only are scientists and artists engaged in the same basic task,—interpreting the fundamental nature of the universe and our place within it—but they do so by employing the same essential artistic and scientific skill: seeing and interpreting.” (page 41)

Computers give us another avenue of visual discovery and interpretation.

In addition to deduction and induction, Levine postulates that we have invented a third great way of knowing: “see-duction”. Though scientists have been visualizing things forever, the told known as the computer shapes us just as we shape it. Levine notes that scientific revolution has always stood on the shoulders of giants, tracing back to artists and philosophers before Aristotle.

“Breaking the scientific paradigm has always required forced outside the scientific community.” (page 43)

Art and science share several key concepts such as mathematical foundations and metaphysics.

9.14. *Curriculum Development via Literary and Musical Forms* by Joel K. Haack

Haack is a professor at the Department of Mathematics in University of Northern Iowa. Here, he talks about integrating literary and musical forms in his teaching.

A geometry course could be taught in a form akin to a novel. There are elements in geometry that are analogous to setting, context, non-human

characters, tension, human characters, and climax (non-Euclidean geometries). The denouement includes philosophical implications. This format can be adapted readily to calculus courses and historical mathematics as well.

Alternatively one could use a musical approach. A unit of “Shape” took the form of theme and variations and elements of fugue. This has the advantage of reminding students where the content stands in the grand scheme of things rather than a station-by-station approach.

9.15. *Algebra Anyone?* by Leslie Jones, with Ted Panitz and Walter Burlage

Leslie Jones is a student at Cape Cod Community College. Ted Panitz, her algebra professor, provides an introduction that gives us context for her growth as a student. An article that she wrote for a school publication is reprinted here with her permission.

“Time, skill, wisdom, and determination are necessary keys for success in both endeavors.” (page 48)

A response by Walter Burlage is also included. According to Burlage, algebra is “taken [by students to be] a little bit like the promise of organized religions (i.e., adhere to these beliefs, live according to these principles, and you shall be rewarded somehow).” (page 49) Burlage adds that his discipline in mathematics helped him to survive and surpass his peers in military boot camp.

9.16. *Mathematical Rebuses* by Arthur V. Johnson II

Some typographic math puns.

9.17. *Book Reviews: UNCOMMON SENSE and THE PHYSICS OF IMMORTALITY* by Harold M. Ness

Here, Ness reviews two books, both by physicists, which are rather philosophical.

Uncommon Sense: The Heretical Nature of Science is by Alan Cromer, a theoretical nuclear physicist. He claims that the reason objective, logical reasoning is so difficult for many students is that it is not a natural trait. The evidence for this is found in the fact that then only culture to develop

objective rational logic was the Greeks, instead of succumbing to egocentric thought like other cultures did. Thus, mathematical thinking must be cultivated by education.

Ness finds issue with this, arguing that he went through education with many of his peers, and despite the same education, many struggled with mathematical thinking nonetheless. He is also critical on Cromer's attack on religion, citing it as "irrational".

The Physics of Immortality: Modern Cosmology, God, and Resurrection of the Dead is by Frank J. Tipler, another theoretical physicist. He uses quantum field theory, deduction, and some unconventional definitions to conclude that there exists free will and life after death in some fashion. Ness agrees with most of Tipler's methods.

9.18. The First CAMS Project: A Humanistic Endeavor by Barbara A. Wainwright and Homer W. Austin

This is a report on the progress and results of the first CAMS project, which was a survey of graduates to assess faculty. The artistic and cooperative nature of the project and the enthusiasm of the students for more than just numerical results is a reflection on how humanistic mathematics can change people's mathematical experiences.

10. Issue 16 November 1997 ISSN 1065-8297

The cover of [this issue](#) includes two pictures of Karl Menger, a deceased mathematician whose life and work is discussed in this issue's featured article.

The editorial team remains the same and the issue has 54 pages, not counting front and back matter.

10.1. Invitation to Authors by Alvin White

White invites readers of the journal to submit their own material, and provides instructions on how to do so.

10.2. From Newsletter #1 by Alvin White

This is reprinted from the very first issue of the journal. See Section [1.1](#).

10.3. *From the Editor* by Alvin White

White presents two quotes. One comments on the importance of producing free-thinking intellectuals. The other talks about the importance of building educational and intellectual communities.

10.4. *A Tribute to Karl Menger* by Seymour Kass

Kass describes Menger's storied upbringing. He describes Menger's early work on defining curves, which was rudely interrupted by a bout of tuberculosis. While recovering, Menger developed a recursive definition of dimension in a separable metric space. Then Kass recalls Menger's time spent with Brouwer and highlights some of Menger's revolutionary work on the axiomatic foundations of projective geometry.

Menger's relationship with the Vienna Circle and his generalized notion of the curvature of an arc in a compact convex metric space are both summarized.

Kass notes that Menger also published some economic literature.

After Hitler's rise to power, Menger fled to America. Unlike many other intellectuals who fled to America, Menger felt quite comfortable with his new life. Kass describes Menger's contributions to resolving the interpretive issue of quantum mechanics. He also describes Menger's formulation of "hazy sets".

Apparently Menger wrote a radical calculus textbook which attempted to present the subject in both a more rigorous and more well-defined style. It was mostly ignored, which saddened Menger greatly and strained his relationship with the mathematics community.

Finally Kass reflects gracefully upon his personal relationship with Menger as a mentor, as a professor, and as a friend.

10.5. *Letter to Professor Kass* by Eve L. Menger

Menger thanks Kass for his heartfelt tribute (see the previous article) to her father.

10.6. *Letter to Professor Kass* by [illegible]

[illegible] praises Kass' tribute to Menger (see Section 10.4), and corrects some of Kass' misspellings of foreign words.

10.7. Letter to Professor Kass by Paul A. Samuelson

Samuelson comments on the importance of Menger's work on economics. Samuelson discusses his own heritage.

10.8. Letter to Professor Kass by Phil Davis

Davis relays his reactions to Kass' fantastic piece (see Section [10.4](#)).

10.9. Book Review: GARBAGE PIZZA, PATCHWORK QUILTS, AND MATH MAGIC: STORIES ABOUT TEACHERS WHO LOVE TO TEACH AND CHILDREN WHO LOVE TO LEARN by Susan Ohanian by Alvin White

The Exxon Education Foundation provides grants to educators with promising ideas for improving mathematics education. Usually these ideas are focused on encouraging creativity, participation, and independence in mathematical thinking. Students should feel like their ideas are their own, and rote skill-drills should be avoided. This book collects teachers', students', and parents' experiences with these new methods of instruction. White highly recommends the book.

10.10. Reflections of Glenmount Reform Effort by Gail Black and Ruth Miller

Black describes the intense math-phobia that afflicted her throughout most of her teaching career. She praises the efforts of the mother of one of her students, Curtis, who helped her overcome her fear of mathematics.

As a result of the collaboration of the two authors, Black attended the NCTM conference and learned about the Standards. She then tried to bring other teachers into the fold, but was rudely rebuffed. Nevertheless, she continued to pursue reform efforts, frequently on her own dime.

Black talks about the success of Math Madness Month, which spurred widespread interest in mathematics education reform at Glenmount.

Miller on the other hand views mathematics as a perpetual journey for understanding. She too reflects upon her collaborative efforts with her son Curtis' teacher, Gail Black. She cautions those who oppose reform against mandating specific pedagogical practices. She argues that teachers need to be exposed to humanistic mathematics instead of being told what to do, and

that only then will teachers be able to independently develop their effective ways of teaching mathematics.

10.11. Research on Children's Learning as a Tool to Improve Math and Science Teaching: A Resource Review by Cynthia Hudley

Hudley lists several books that include a selection of readings on topics as diverse as developmental psychology, education reform, and curriculum construction. The books are designed to provide background knowledge to teachers who are uncertain of how to improve their mathematics and science instruction. Hudley agrees with the authors of these books in principle, but criticizes them for frequently choosing needlessly simplistic essays.

10.12. A Situational Pedagogy for Elementary Mathematics by Vincent Haag

Haag defines humanistic mathematics as follows:

“Children are continually involved in the process of learning mathematics as participants, not as spectators; mathematical ideas grow out of reactions of children to intriguing situation posed by the program . . . ; learning of routine arithmetic skills occurs in the process of reacting to the situations posed and not only in rote drill; the many facets of mathematics reinforce each other . . . with arithmetic, geometry, and probability each interacting with and clarifying the others; having accepted the proposition that no one can master an idea completely on first, or even second, encounter, the main mathematical ideas continue to reoccur in a spiral curriculum in which the ideas are viewed many times from different perspectives and in deeper and more revealing form; the teacher relinquishes the role of mathematical authority, becoming a facilitator as the children discuss and investigate ways of dealing with the situations posed . . . the authority then belongs to logical thinking and the mathematics as it is developed; reliance on language is reduced in the early years to allow development of simple mathematical concepts that only seem complex when described in words; intuitive logic and thinking skills are developed indirectly through games and story situations that involve cataloging attributes of arithmetic and geometric relations; students write

their own textbooks in the form of journals that record the high points and discoveries of the lessons.”

Haag notes that the humanistic program is hard to implement for many reasons. He lists some examples of problems facing reform mathematicians. He believes that a decisive shift in the national consciousness is a necessary predecessor to widespread change. He proposes “situational pedagogy” as an interim concept to be used until this shift is complete.

Haag also gives examples of mathematical questions which satisfy his definition of humanistic mathematics, covering each age group in the range from 5 to 15. He draws the reader’s attention to the culture-neutrality of these examples.

10.13. Helping Students with Attention Deficit Disorder Succeed in a College Mathematics Class by Pamela E. Matthews

Matthews describes the historical background behind section 504 of the Rehabilitation Act of 1973. He then describes some of the ways in which gifted students with ADD might struggle at a university level. He notes that students with ADD who are struggling academically may choose not to approach the professor, nor to take advantage of the aid guaranteed them by section 504 of the Rehabilitation Act of 1973. He argues that providing a student with ADD with a structured framework for learning can alleviate some of the difficulties that they may experience.

Matthews argues that untimed tests are inadequate assistance for students with ADD, and states that the professor should also be present during tests to deliver instructions orally. He also argues that students with ADD should be allowed to learn at their own pace.

10.14. Numbers - 1 by Anonymous

This poem traces the developmental process by which young children learn numbers, and then reflects upon the metaphysical power of numbers.

10.15. The Reform Calculus Debate and the Psychology of Learning Mathematics by James M. Cargal

This is a commentary on a debate between an advocate of reform calculus and an advocate of traditional teaching methods. Cargal argues that foundational

proofs do not belong in introductory calculus. He argues that rote learning can be valuable when used as a foundation for higher learning. He notes that many students proceed to higher levels of mathematics with only a shallow level of understanding. He blames this problem on poor teaching.

Cargal believes that each semester of calculus should correspond to roughly fifty years of mathematical research. He encourages teachers to cover less material each semester.

10.16. Numbers - 2 by Anonymous

This poem draws connections between numbers and music.

10.17. Teaching Mathematics Appreciation to Nonscience Majors by Josefina Alvarez

Alvarez notes that many students feel very apprehensive about mathematics because it is taught poorly in K-12, and because it seems inaccessible to the curious novice due to an abundance of technical jargon and snide elitism. Alvarez suggests some strategies for encouraging nonscience majors to appreciate mathematics, most of which revolve around connecting it to other fields or demonstrating its worth as a collection of great ideas. Alvarez chooses readings and topics which emphasize continuity with all aspects of the students' lives when teaching mathematics appreciation. Her course is highly interactive with minimal lecturing. Many students have responded positively to her methods.

10.18. Numbers - 3 by Anonymous

This poem questions whether numbers come from God, from man, or from nature.

10.19. John Dewey, the Math and Science Standards and the Workplace by Bernard A. Fleishman

Fleishman discusses Dewey's beliefs in the power of pedagogical research and in the necessity of progressive education. He describes Dewey's oft-misconstrued concept of adjustment, which refers to the tendency of organisms to alter the environment in response to their own needs. Dewey believed

that teachers should rely upon their maturity and insight to effectively guide students in their learning.

Fleishman briefly discusses the history of mathematics education reform movements in the United States, noting that few of them have led to lasting changes. Current reform literature argues that teachers should build their curriculum off of the knowledge that students already have. Furthermore, teachers need to encourage students' critical thinking skills. Fleishman connects these ideas with Dewey's pedagogical philosophy.

Dewey argued that experience is interactive and transactional. These thoughts precipitated a widespread agreement on the importance of problem-solving and student-teacher communication in mathematics education. He also believed that collaborative learning was important, and that competitive learning was ineffective. This concept is now known as cooperative learning.

Dewey criticized progressive education advocates for defining their philosophy in opposition to traditional education, for regarding any form of direction or instruction by teachers as infringement upon the independence of students, and for disregarding the lessons of the past. He believed that teachers should construct for students successive experiences which built upon each other. Dewey criticized many progressive teachers for failing to follow up on their lessons. The Standards recognize these problems.

10.20. The Object and the Study of Mathematics by Pinar Karaca

Putnam argues that mathematics is absolutely true, independent of the material world and of our experience of it. However, if mathematics is independent of lived reality, then on what grounds does it stand?

Karaca argues that mathematics is the study of the consequences of the links between definitions, conclusions, and auxiliary assumptions. She states that the foundation of a good mathematical theory is realistic assumptions, simple and precise definitions, and fruitful arguments. She further argues that the possibility of contradictory auxiliary assumptions sometimes results in Kuhnian paradigm clashes. She advocates the use of quasi-empirical inductive methods in mathematics.

10.21. Inspiration in England by Mary McDermott

McDermott notes that inspiration precludes progress in mathematics. She observes that burnout makes inspiration impossible. She then argues that

scheduling and grading in American colleges create a system in which students try to maximize their grades, and in which students do not care about intellectual development.

McDermott also criticizes the strict division between academic life and social life in American colleges and praises Oxford for its independent and unstructured class structure. She argues that the structure of Oxford's classes forced her to take learning more seriously. Consequently, learning became more fun.

10.22. A Course in Mathematical Ethics by Robert P. Webber

Webber discusses his difficulties in constructing a course on mathematical ethics. It is not a subject that has been given much thought by mathematicians, and there is very little available literature.

He lays out the following goals for the course:

“Mathematicians need to think about the consequences to society of applying the knowledge they possess; many ethical and moral dilemmas arise in the normal course of a mathematician's career, and the professional must be able to recognize and solve them; mathematicians need to understand the impact of academic material on the rest of society; mathematicians need to have a better appreciation of the relationship between technical issues and human values.”

Webber describes the layout of the course and the nature of its assignments. The course deals heavily with intellectual property rights, plagiarism, whistleblowing, and the censorship of cryptography research.

10.23. Book Review: CHALLENGING EUROCENTRISM IN MATHEMATICS EDUCATION, Arthur B. Powell and Marilyn Frankenstein, Editors by Karen Dee Michalowicz

Michalowicz defines ethnomathematics as the study of how culture affects mathematical thinking. Michalowicz notes that many people don't take ethnomathematics seriously, viewing it as little more than an amusing distraction. Michalowicz encourages the reader to expand his or her definition of mathematics, and directs them to the relevant sections of the book under review. Malkevitch praises the book for developing an interactive, culturally sensitive, dialectic method for teaching ethnomathematics.

10.24. *Book Review: NEXUS: ARCHITECTURE AND MATHEMATICS*, Kim Williams, Ed. by Joseph Malkevitch

Malkevitch claims that a successful mathematics education results in a large number of students choosing to practice math professionally, and also in broad societal cognizance of the intrinsic value of mathematics. Malkevitch says that *Nexus* clearly demonstrates the utility, beauty, and value of mathematics in a wide variety of settings. He praises the layout of the book. He then criticizes the book for neglecting the subject of structural engineering.

10.25. *Comments and Letters* by Delene Perley

Perley informs the readers of where they can purchase a copy of Marcia Ascher's book *Ethnomathematics*, which was reviewed in Issue #14, see Section [8.13](#).

10.26. *In Future Issues* by Alvin White

White lists upcoming important and interesting articles.

11. Issue 17, May 1998. ISSN 1065-8297

The cover of [this issue](#) displays a figure from Randal J. Bishop's "The Use of Realistic Imagery to Represent the Relationships in a Four-Dimensional Coordinate System" (see Section [11.4](#)). It is captioned "He breathes 4D geometry".

The main editorial staff remains the same. The editor is Alvin White (Harvey Mudd College). The associate editors are Susan Addington (Cal State University, San Bernadino), Stephen Brown (SUNY Buffalo), JoAnne Growney (Bloomsburg University), Joel Haack (University of Northern Iowa), Sandra Keith (St. Cloud State University), Richard Montgomery (So. Oregon St. College), Harald Ness (University of Wisconsin Center), Frances Rosamond (National University, San Diego), Gian-Carlo Rota (Massachusetts Institute of Technology), and Julian Weissglass (University of California, Santa Barbara).

Various math poems by sixth and seventh graders taught by Margaret Schaffer at Hale Middle School in Los Angeles are printed throughout the journal.

This issue contains several articles on how to teach mathematics in a way that satisfies the question “why are we learning this?” There were no articles about the correct content to teach students of mathematics and a few about mathematics as an artistic discipline.

The issue has 48 pages, not including the front and back matter.

11.1. From the Editor by Alvin White

The editorial section welcomes the new production managers Linley Hall and Tom Werner. There is also an acknowledgement of friends and colleagues who passed away recently.

11.2. Robert Davis: In Memoriam by Carolyn A. Maher and Robert Speiser

Davis created the Madison Project, an innovative school mathematics program that “emphasized careful and attentive response to how students thought about the mathematics they explored” (page 1). He also co-founded the *Journal of Children’s Mathematical Behavior* (today called *Journal of Mathematical Behavior*) and edited it until his death.

11.3. Randal Bishop Punges Into 4-D Space by C. Ernesto S. Lindgren

This is a comment on Randal Bishop’s “The Use of Realistic Imagery to Represent the Relationships in a Four-Dimensional Coordinate System”, also printed in this journal, see Section 11.4. Lindgren is from the Federal University of Rio de Janeiro in Brazil.

Lindgren and Steve M. Slaby’s book is Bishop’s predecessor in exploring 4-D space. He understands Bishop to be a photographer of 4-D space and points out that just as a point is “at home” on a line, we 3-D beings are “at home” in 4-D.

11.4. The Use of Realistic Imagery to Represent the Relationships in a Four-Dimensional Coordinate System by Randal J. Bishop

Bishop discusses the fundamentals of dimensionality in a 4D coordinate system and offers analogies with which to understand and illustrate it. He uses the language of art perspective to describe dimensionality and representation of higher dimensions in lower ones. For example, the 4D hypertetrahedron is composed of 4 mutually perpendicular one-dimensional lines, 6 two-dimensional planes, and 4 three-dimensional spaces.

11.5. Thinking About the Preparation of Teachers of Elementary School Mathematics by Jane Wenstrom, Kathleen Martin, and Susan King

This is a piece by two professors and a graduate student from the Mississippi University for Women. The authors organized luncheon discussions involving 12 students in the teacher education program. They have observed that in their context, where all undergraduates are required to take a course in college algebra or higher, all of the students chose to take college algebra. The students revealed that those who felt unchallenged by algebra in high school were bored in the college course and even lost interest in mathematics altogether. Those who had had trouble with algebra in high school felt the same frustration in college. The issue was not lack of continuity but that it is exactly the same as the high school experience. If college algebra is to be a significant experience for undergraduates then that significance needs to be both visible and accessible to them.

The students perceived college algebra to be irrelevant, unlike their courses in humanities and social sciences. They “did not see that mathematics could draw upon the multiple modes of human thought which other subject areas draw upon.” (page 13) They wanted to learn and teach mathematics, but the mathematics courses they took alienated them. Math is seen as a genetic endowment rather than a learned collection of skills and memorization. Mathematics courses need to make students learn their way around and feel at home in an environment of mathematical ideas.

Also mentioned is the gender disparity in fondness for mathematics. Authors postulate that it is because mathematics, as a human construction, carries the biases of its (male) creators.

11.6. Platonism and All That by Bob Burn

Burn is a professor at Agder College in Norway. This is a reflective piece on his views of the nature of mathematics and the formalism vs Platonism debate. He considers himself a humanist.

11.7. Real Data, Real Math, All Classes, No Kidding by Martin Vern Bonsangue

Bonsangue is a professor of mathematics at California State University, Fullerton. He has taught at middle schools, high schools, and community colleges as well. Good pedagogy will not fix a bad curriculum.

“I wouldn’t even want the same old stuff in a new way” (page 17)

What he wants most as a teacher is an answer to the question “When am I going to use this stuff?”

With technology and the internet, we can now access data with which we can use mathematical analysis skills. In this context, Bonsangue strives to teach that mathematical and algebraic skills can be used to understand the world around us and even take on physical characteristics. This approach also gives the author more engagement in thinking about the material, such as what parts of the curriculum are useful and applicable to many questions.

11.8. Problems That Matter: Teaching Mathematics as Critical Engagement
by Jeffrey Bohl

Jeffrey Bohl is a professor at University of Wisconsin, Madison. He calls for mathematics to be taught by ‘mathematizing’ the world rather than ‘concretizing’ mathematics.

Bohl, like some of the earlier authors, also struggles with answering the question of “what is this class for?” Generic answers fall into one of four categories: tomorrow, jobs, general mental strength, and tests. However, these claims to usefulness often don’t hold up in reality. What ends up happening is that in reality, math education and ability plays a big part in “our society’s publicly-funded human sorting service” (page 23).

Bohl believes mathematics is important because it allows students to relate to their immediate world, and to understand how mathematics affects the world they live in when it is used by companies and government to determine policy. The third reason it is important is because mathematics is linked intimately with rational thought, which is “widely accepted as the only worth mode of cognition” (page 24) and so is vital for social survival.

“There is a gulf between teaching ‘realistic’ mathematics—which is word-problem- and situation-based—and ‘real’ mathematics, which actually involves the lives and interests of the students in the classroom.” (page 25)

Real mathematics involves students exploring their worlds with math. When this happens, and students explore mathematical aspects of their own lives

and interests, teachers can “concentrate on their intellectual development rather than on behavioral manipulation.” (page 25) This approach also has the advantage of honoring students from non-dominant cultures inviting their lives into the curriculum and gaining knowledge about them through experience.

“Pedagogically, I like to think of it both as using math to uncover pattered relationships, and as imposing mathematical order on unordered realities.” (page 25)

11.9. *Book Review: THE COURAGE TO TEACH* by Sandra L. Keith

The Courage to Teach was written by Parker Palmer, a writer/teacher/activist who “works independently on issues in education, community, leadership, spirituality, and social change.” The book does not deal directly with teaching mathematics, but instead it is about teaching in broad terms with involved faculty and departments. The author decries the absolutist way of teaching that is popular among STEM fields and cites some as advocating protecting the field from students rather than teaching students to immerse themselves in the field.

11.10. *On Solving Equations, Negative Numbers, and Others Absurdities: Part I* by Ralph A. Raimi

Raimi is a professor at the University of Rochester. In this article, he explores the logic of algebra and the ways in which people are often taught to understand algebraic sentences as truths, except they might not even be true—for most values of x , the equation is false—so what then?

“We are pretending that x and $x-50$ are numbers, maybe not known to us, but, we hope, known to God at least.” (page 38)

He deconstructs a simple problem into a series of IF-THEN statements, because in English, an entire sentence can be true even when the dependent clauses inside are false (such as “If pigs could fly, then they would have wings.”) Thus, we end up with a “chain of implications without truth” (page 39) The logical function of checking the solution at the end is not only is it good for the students, as teachers often say, but also that checking is the only genuine proof of the result. Checking is actually a deductive proof. Part 2 of the article continues in Issue #18, see Section [12.9](#).

11.11. *The Poetics of $E = MC^2$* by Richard A. Schwartz

Schwartz is an English professor at Florida International University. He argues that the equation $E = MC^2$, which describes the paradoxical equivalency of energy and matter, is also paradoxical in that it is so simple to say yet difficult to comprehend. He compares vowels to energy and consonants to mass; they, too, interlock in aural paradox. Aurally, the equation shows poetic balance. M and C show within themselves complementary traits of energy and matter.¹¹

11.12. *Death, Trial and Life* by Prem N. Bajaj

Bajaj, a professor at Wichita State University, reflects on the value of struggle in mathematics education. Anecdotally, a professor saw a student make progress on a question after being unable to decipher the hint and gave them full marks and distributed a complete version of the solution to the class with credit to the student.

11.13. *The Smarandache Semantic Paradox* by Anthony Begay

Begay is a professor at Navajo Community College. The piece is a tongue-in-cheek proof of a paradox: “All is possible, the impossible too!”

12. Issue 18. November 1998. ISSN 1065-8297.

The cover of [this issue](#) includes a quoted poem from Lao Tzu, also quoted in Eichinger’s article (see Section 12.4), an image of a function machine used in Droujkova’s article (see Section 12.3), and another image of Greek and Roman architecture used in Williams’ article (see Section 12.10).

The editorial board remains the same and the issue has 50 pages, approximately in the same range as in the most recent issues.

The common theme to many of the articles in this issue is early childhood education. This is described in the front inside cover page as follows: “It’s never too early: Many of the articles in this issue discuss humanistic mathematics with children in elementary grades.”

¹¹ It seems that the author considers the E sound in E and the E sound in M to be the same E sound. This is hard to comprehend for an English speaker.

12.1. Invitation to Authors by Alvin White

White invites the reader to submit their own material to the journal for publication. He briefly covers the formatting guidelines and submission instructions.

12.2. From the Editor by Alvin White

White reflects upon the difficulty of reforming education, and criticizes those teachers who resist change. He comments on some ongoing reform efforts in California.

12.3. Natural Math by Maria Droujkova

Droujkova claims that young students can learn higher mathematics by discovering concepts for themselves and by taking control of their own teaching. The Natural Math program is based upon this philosophy. In the program, participation is voluntary, students must discover concepts for themselves, and students can veto activities that they don't like.

Extremely young children can also understand low-level abstractions such as arithmetic. However, they have great difficulty communicating their understanding. When children sit quietly in thought for a long time, teachers and parents falsely assume that they need help. Droujkova often finds herself restraining overeager educators!

Sufficiently intelligent children can even understand higher-level abstractions. Droujkova tells the story of one of her students, Emily, who grew to love matrix multiplication and cryptography.

Children can also develop and employ their own algorithms. Droujkova talks about several Natural Math students who have done this.

In the conclusion, Droujkova pens a manifesto for why young students ought to be taught concepts from higher mathematics. She argues that it encourages students to take a broader, more open-minded view of mathematics. In addition, the students enjoy themselves, often to a much greater degree than adults and college students do. Furthermore, students typically find the experience to be very meaningful. Droujkova claims that gently introducing students to the world of higher mathematics avoids many of the pitfalls that can occur when this is done later in life. Droujkova believes that this is especially true in the area of advanced problem solving.

12.4. *Do the Great While It Is Still Small: Humanistic Teaching in Elementary School* by John Eichinger

Inspired by the poetry of Lao Tzu, Eichinger claims that mathematics is humanistic because it is a distinctly human endeavor which is deeply ingrained in both culture and society. After reviewing a wide berth of pedagogical and psychological literature, Eichinger concluded that there are four essential components to a humanistic elementary mathematics education: “interactive/collaborative, holistic/relevant, interdisciplinary, and problem-based components.”

Students should interact in meaningful ways with their teachers and with each other. Eichinger advises using hands-on and what he calls “minds-on” activities to encourage positive interaction. Proper mathematics education centers on the values, the desires, and the goals of students. Teachers ought to be empathetic, nurturing, and respectful towards their students.

Eichinger lists a number of sources describing how to create an interdisciplinary mathematics curriculum. Some of the other disciplines mentioned include science, art, history, and literature.

When students solve problems, they are developing critical thinking ability, which is useful in all aspects of modern life. Eichinger advocates Wheatley’s model of problem-solving. This model proceeds in three steps. First, “students are challenged with a task”. Second, “work is done in small groups.” Third, “the groups convene to discuss their solutions.”

Eichinger asserts that assessment strategies must be updated to reflect new developments in mathematics teaching, but fails to elaborate on how to do so.

12.5. *The Legend of the Apple* by Raul A. Simon

Simon poetically retells the well-known legend of Newton and the apple.

12.6. *Mathematics Found in Poetry* by Alexis Mann

Mann highlights specific analogous concepts in poetry and geometry. She accompanies her arguments with well-known poems that demonstrate her ideas.

12.7. Plastic Pebbles by Virginie H. Mitchem

This is a lengthy poem reflecting upon the evolution of mathematical thought from the natural to the technological.

12.8. What Does Equality Mean? - The Basque View by Marcia Ascher

In both mathematics and politics, the words “equality”, “equivalence”, and “congruence” are used to refer to many different concepts. At times, it can be confusing to tease out which meaning an individual is employing. The Basque concept of equality, or *bardin-bardina*, is underpinned by two principles, rotation, or “*unguru*”, and alternation, or “*aldikatzia*”.

Ascher first describes the geography, history, and politics of the Basque region. Then she describes the bread-passing ritual that is common in the communities of the region. This ritual corresponds with a cyclic group of arbitrary size. As a result of this ritual, reciprocity is not viewed as the exchange of equivalent goods between two individuals. On the contrary, reciprocity is serial.

Ascher also notes that the divisions of labor in shepherding and cheese-making activities are analogous to two well-studied groups. She then analyzes these groups. The division of labor in Basque is designed to preserve social hierarchies.

12.9. On Solving Equations, Negative Numbers, and Other Absurdities: Part II by Ralph A. Raimi

This is a continuation of a paper from the previous issue. See Section [11.10](#).

In this article, Raimi talks about the confusion that elementary-schoolers experience when learning negative numbers. He blames this confusion on their former teachers and old textbooks, which taught that subtracting a larger number from a smaller number was impossible. Raimi summarizes De Morgan’s elaborate thoughts on negative numbers. De Morgan derides complex numbers as absurd and as having no correspondence with physical reality, yet still acknowledges their mathematical utility. Raimi discusses why negative numbers are not absurd through the “impossible” solution to the garden problem. He then presents an example in which complex numbers correspond to something physical. He claims that this demonstrates the non-absurdity of complex numbers.

12.10. Architecture and Mathematics: An Introduction for Elementary and Middle School Children by Kim Williams

Williams discusses a program she developed to teach children architecture. Her program cultivates both artistic creativity and mathematical thinking.

12.11. Changing Ways of Thinking About Mathematics by Teaching Game Theory by Ein-ya Gura

Mathematics is a much broader and more diverse field than most people realize. Any individual looking to enrich their worldview should consider studying mathematics. Mathematics is a crucial component of intellectual diversity. Indeed mathematics is an underappreciated art form.

In this paper Gura describes a high school mathematics course centered around game theory, developed to help students appreciate the above features of mathematics.

12.12. Manifesto on Mathematics Education by Saunders Mac Lane

Mac Lane criticizes reform advocates for focusing on buzzwords and politics at the expense of the very subject that is their area of study: mathematics! Mac Lane argues that at the collegiate level, not all students want or need to succeed in mathematics, and that therefore teachers should not be too concerned when a student fails.

12.13. My Dance Is Mathematics: Poems From a Mathematics Teacher by JoAnne Growney

Growney presents two poems, one about the internal doubts that plague students and teachers, and the other about the connection between time and geometry.

12.14. ISAMA 99: Invitation and Call for Papers

This brief section describes the ISAMA conference, which addresses the intersection of architecture, the arts, and mathematics. It invites the readers to attend and to submit material.

12.15. In Future Issues by Alvin White

White lists upcoming articles that are interesting and important.

13. Issue 19. March 1999. ISSN 1065-8297

The cover of [the issue](#) displays a Möbius strip, to connect with Fleron's article (see Section [13.14](#)), a continued fractions expansion, to connect with de Spinadel's article (see Section [13.13](#)), and a spirograph image, to connect with Deck's article (see Section [13.6](#)).

The editorial team remains the same. The editor for [this issue](#) is Alvin White. The associate editors are Susan Addington (Cal State University, San Bernadino), Stephen Brown (SUNY Buffalo), JoAnne Growney (Bloomsburg University), Joel Haack (University of Northern Iowa), Sandra Keith (St. Cloud State University), Richard Montgomery (So. Oregon St. College), Harald Ness (University of Wisconsin Center), Frances Rosamond (National University, San Diego), Gian-Carlo Rota (Massachusetts Institute of Technology), and Julian Weissglass (University of California, Santa Barbara).

This issue spans 54 pages and contains the letter from newsletter #1 (see Section [1.1](#)).

13.1. From the Editor by Alvin White

Here, White reflects on the meaning of "humanistic mathematics".

"Much discussion about the meaning of Humanistic Mathematics occurred in the early days. Was it human mathematics? Humane mathematics? . . . An informal, personal understanding of the expression was sufficient for conversation and activities in and out of the classroom."

White also suggests emphasizing the "network" aspect of the Humanistic Mathematics Network Journal, proposing to meet with groups of colleagues to discuss how to enhance the humanistic network.

13.2. *The Classroom Encounter* by Reuben Hersh

Hersh's article reflects on math reform and how it can improve. Hersh does not seem too optimistic because the reform work focuses on curriculum and teaching strategy without addressing the encounter between teacher and student.

“The classroom is a place where information is transferred, but before that, it's a place where humans encounter each other.”
(page 1)

The student needs to feel cared about. This sort of “pedagogical concern” is usually laughed at by mathematicians. Hersh cites pieces from an MAA pamphlet, the success of Potsdam College's mathematics program, and anthropological work that found that 40-60 percent of STEM undergraduates left their majors for reasons that can be traced to bad teaching. The solution is to concentrate on the leaders of American mathematics and have them declare that it matters how math is taught and work should be done to retain students and their interest.

13.3. *Letter to The New York Times* by Arthur B. Powell and Miriam L. Yevick

Powell and Yevick are retired and current professors, respectively, of mathematics at Rutgers University in New Jersey. This is their letter to the editor of *The New York Times* regarding their disagreement with the intention to drop remedial mathematics programs from colleges.

Yevick found from her time teaching at a program for part-time students that teaching remedial mathematics is meaningful for both the teacher and the student. Powell feels that it is only in a college setting that such work can be made to help students realize their mathematical potential while pursuing their own interests.

13.4. *Book Reviews: EINSTEIN: A LIFE*, by Dennis Brian, and *THE SILVER HORSE-SHOE*, by Javad Tarjemanov by Harald M. Ness

Ness reviews biographies of Albert Einstein and Nikolai Tesla, respectively.

Brian's portrayal of Einstein is the most comprehensive, best written, and most humanistic biography that Ness has ever read. Ness praises Einstein for his humility and deference to his predecessors.

Ness also praises Tarjemanov's biography of Nikolai Lobachevski for its narrative fortitude and says it "reads like a novel".

13.5. Numbers Man by Lawrence Mark Lesser

This is a "math love song" that Lesser imagines his father (college calculus tutor) could have written for his mother (his father's pupil).

13.6. Spirograph® Math by Karin M. Deck

This paper explores the mathematics of the Spirograph, a popular toy that can be used to draw designs. The author gives names of particular patterns possible with spirographs. She varies parameters to show their effects on the resulting spirograph. Finally she discusses symmetry groups and gives theoretical practice problems regarding spirographs.

13.7. The Difference Between Pure and Applied Mathematics by Adrian Riskin

Riskin is a professor at the department of mathematics at Mary Baldwin College. He claims that there is no significant difference between pure and applied mathematics. The main difference is that applied math is done with an end in view, whereas pure math seems to be an end in itself.

An argument is as follows: Suppose mathematics is applied if it meets basic human needs, and pure if it meets spiritual ones. However, the argument can be made that basic and spiritual needs are inexplicably linked and it is hard to say that satisfying one has no relation to satisfying the other—therefore they are one and the same, and so are pure and applied mathematics.

13.8. Music of the Spheres by Lawrence Mark Lesser

A poem about astronomy and music.

13.9. The Prospects for Mathematics in a Multimedia Civilization by Philip J. Davis

Media technology has become completely intertwined with the modern experience. One cannot accurately predict the future, especially in mathematics. Davis argues that mathematics will be pulled forward by profit motives on the applied side, and that the pure side will naturally follow the applied side. He gives some examples of how recent mathematical findings are being used in a wide variety of fields. He suspects that as our social and professional lives become more intertwined, the quality of scientific and mathematical research will suffer. The ease of online publishing has already begun to decrease the global quality of work. This is because it makes peer review unnecessary, and because it increases the time that mathematicians must spend on things such as typesetting and self promotion. He ventures on to suggest that computers may make mathematical thought obsolete, as more and more problems can be solved through massive computation instead of through the more difficult process of high level reasoning.

Davis argues that mathematical proof is but one type of mathematical evidence, and that computers make statistical evidence possible. He also argues that the elitist, anti-emotional culture of mathematics is what drives women away from the field. He predicts that mathematics will become driven more by imagination and paradox and less by common sense and mathematical rigor.

13.10. Mathematicians Can Be Wrong by Tony Dunlop and Ken Kaminsky

Dunlop and Kaminsky list some quotes by famous mathematicians, and humorously explain why these quotes are incorrect. They conclude that mathematicians are just as fallible as anyone else.

13.11. To My Students by Alvin White

Those students who wish to study in technical fields should also study the humanities. Their humanistic studies will deepen and broaden their knowledge of their majors. The heart of even the most technical field can be found well beyond its facts and processes. Mathematics is humanistic because it is inexorably enmeshed within human civilization. Students must learn to embrace the unknown. They should demonstrate productivity and creativity. Most importantly, mathematics is beautiful.

13.12. Cantor's Coat by Lawrence Mark Lesser

Lesser's poem discusses the importance of family and faith in Cantor's mathematical endeavors.

13.13. A New Family of Irrational Numbers with Curious Properties by Vera W. de Spinadel and Jose M. Paz

de Spinadel and Paz discuss some interesting properties of the metallic means family of irrational numbers.

13.14. The Möbius Metaphor by Julian Fleron

People typically associate mathematics with rote and boring activities such as memorizing multiplication tables and balancing their checkbook. However, mathematics is actually an intellectually stimulating, beautiful system which underlies all experience. Möbius strips are a wonderful example of this principle.

13.15. Mathematical Fiction by Pat Mower

The next three subsections are choice responses to a mathematical fiction assignment in Mower's mathematical history course. Here Mower briefly describes the assignment.

13.16. A Day in the Life of Diophantus (c. 251 A. D.) by Rebecca Pékruł

This story, written in response to an assignment described in the previous section, imagines a day in the life of Diophantus through the lens of an early Roman radio interview.

13.17. Limericks on the "Century of Genius" by Thomas J. Lipp

This is a series of limericks, written in response to the assignment described in Section [13.15](#), about great mathematicians who lived and worked between 1600 and 1720.

13.18. News Extra: Ancient Document Discovered by Shawn Dolezilek

Dolezilek's story, written in response to the assignment described in Section [13.15](#), centers on the discovery of an ancient document revealing that Diophantus had prophetic dreams about modern mathematics education.

13.19. Leibniz: His Philosophy and His Calculi by Eric Ditwiler

This article explores how Leibniz's excursions into calculus influenced his theological beliefs.

13.20. Book Announcement: WOMEN, ART, AND GEOMETRY IN SOUTHERN AFRICA by Paulus Gerdes

This book encourages African women to nurture their creative mathematical potential. It is going to be reprinted soon.

14. Issue 20. July 1999. ISSN 1065-8297

The cover of [this issue](#) is described in the front inside cover as follows: "Inside the Koch Snowflake from Catherine A. Gorini's essay on the relation between art and mathematics [see Section [14.20](#)] is an example of poor math teaching given by Jerome Dancis [see Section [14.5](#)]. In this issue Dancis, Jack Lochhead [Section [14.7](#)] and Frances Kurwahara Lang [Section [14.8](#)] offer views on the state of K-12 mathematics education."

Rota is no longer listed as an associate editor as he has recently passed away, see the article on him in Section [14.3](#). The rest of the editorial team remains the same.

The issue is 52 pages long.

14.1. Invitation to Authors by Alvin White

White invites readers to submit their own contributions to the journal, and describes the process for doing so.

14.2. From the Editor by Alvin White

White mentions that articles on mathematics education reform have appeared in national newspapers. He talks about some of the important articles which appear in this issue. He invites the reader to join the journal's email list.

14.3. Gian-Carlo Rota by Richard Stanley

Stanley recounts details of Rota's life, Rota's academic and professional achievements, and Rota's great personality in this touching and heartfelt tribute to Rota's life and work.

14.4. Untitled Poems by Geoffrey Smith, Ryan Best, and Alexandra Holliday

Smith's poem extols the utility of mathematics in everyday settings. Best's poem recounts some of the strategies students can use to improve their understanding of algebra. Holliday's poem addresses her adoration for mathematics.

14.5. Middle School Math Teaching and How It Harms Our Children by Jerome Dancis

Dancis criticizes the calling-out method of instruction. He argues that it encourages students to think about mathematics robotically while discouraging them from exchanging ideas with their teachers and with their peers. Dancis believes that middle schools only teach mathematical skills, and not mathematical understanding. Without mathematical understanding, students cannot be expected to do well when confronted with unfamiliar or novel problems. He criticizes American mathematics education for being overly repetitive and disconnected, citing statistics which demonstrate that American mathematics educators use class time inefficiently. He also believes that American mathematics teachers assign too much busywork. All in all he criticizes the achievement-centered nature of American mathematics education, which leads students to strive for high grades and success on standardized tests instead of the acquisition of knowledge.

After many other serious issues raised, Dancis concludes with a list of six goals for mathematics education:

“Students will develop an appreciation of and a positive attitude towards mathematics . . . students will develop an understanding of mathematics . . . students will acquire mathematical facts and skills . . . students will develop the ability to express and interpret mathematical ideas and relationships . . . students will develop . . . mathematical reasoning ability . . . students will develop the ability to apply mathematics in personal, societal, technological, scientific, and career settings.”

14.6. *Changing the Subject: or, Would You Hire a Good Clarinet Teacher to Teach Your Child the Violin?* by Jerome Dancis

Mathematics instructors should be knowledgeable about and well-versed in modern mathematics. However, more often than not language arts, history, and arts teachers end up teaching mathematics. They tend to do a poor job, and the students suffer greatly. This is not the fault of the teachers, who are presumably trying their best, but of the administrators, who need to assign qualified individuals to work in the mathematics department.

14.7. *Is Our Practice of Humanistic Mathematics Actually Humane?* by Jack Lochhead

Lochhead supports humanistic mathematics education reform, especially in elementary school. He notes that middle schools and high schools have been slow to implement humanistic mathematics reform policies. He argues that switching from student-centered education in elementary school to teacher-centered education in middle school and high school is more damaging than simply having the entire system be teacher-centered. Thus he concludes that elementary schools, middle schools, and high schools need to coordinate their efforts more effectively.

14.8. *Is Mathematics Education Taking a Step Backwards?* by Frances Kuwahara Lang

Lang describes some of the ways in which education legislation in California reinforces existing racial and socioeconomic power divisions. She discusses the problematic legacy of American educational philosophy, and uncovers how it reinforces white male privilege. She criticizes the California government for spurning the Standards and attempting to develop their own which are excessively concerned with the acquisition of skills and which are developmentally inappropriate. She suggests that the California government's report on their new educational policies is inconsistent and vague, which will result in most teachers failing to heed its recommendations anyways.

14.9. *Circle* by Anna Palco

Palco's poem reflects on the relationship between infinity and circles, and on the exquisite beauty contained therein.

14.10. Multiplication by Molly Hager

Hager's poem concerns her deep-seated fondness for multiplication.

14.11. Equations by Benjamin Davidson

Davidson humorously attacks the belief that algebra is impenetrable.

14.12. Research Papers in a Math Methods Course: a Window Into the Life of Ramanujan by John Grant McLoughlin

Mathematics has come to be viewed as a cold, inhuman field unrelated to other fields such as history, philosophy, art, and literature. McLoughlin believes that this is a misguided view, which ignores the rich cultural legacy of mathematics. McLoughlin recommends using research papers or poster assignments to correct this misguided belief.

14.13. A Window Into the Life of Ramanujan by Marlene Neff

Neff describes Ramanujan's childhood and education in rich detail. She then talks about Ramanujan's testy, sensitive personality and his collegiate failures. She also discusses Ramanujan's transition to married life and the resulting professional arrangements that he made. Neff praises Ramanujan's dogged persistence in the face of terminal illness, and comments on the significant influence that Ramanujan's theorems have had on the mathematical world.

14.14. Numbers by Shea Ybarra

Ybarra presents a children's poem which exalts the vast applicability of numbers.

14.15. Circles by Valentino Loiacono

Loiacono presents a children's poem about the wide range of places in which circles can be found.

14.16. *Using Writing to Connect with Our Mathematics Students* by Ann Sitomer

Sitomer uses what she calls “minute papers”, which are short questions that students must answer in writing at the end of class. Minute papers are used as a forum for discussion between Sitomer and her students. They usually ask students to summarize the day’s lesson and ask any lingering questions that they might have. Minute papers are also used for self-assessment.

The minute papers assisted timid students in their learning, and by the end of the semester Sitomer felt much closer to her students than she had in previous semesters. Many students liked the minute papers.

14.17. *Between Childhood and Mathematics: Word Problems in Mathematical Education* by Andre Toom

Educational activities for children must incorporate a degree of imagination. Imagination and creativity are essential for success in abstract mathematics. Some teachers criticize word problems with a thoughtless “who cares?”. Toom believes that this is a dangerous criticism, since word problems are often easy to solve and intellectually stimulating. When a student says they don’t care, it’s usually a cover-up for their inability to complete a problem.

Word problems should set up an idealized, imaginary system and then have students solve it. They do not need to be completely realistic, contrary to Usiskin’s advocacy.

Efforts to convince students that algebra will be useful in their daily life usually ring phony. Toom notes that algebra has no use whatsoever in many areas that are interesting to children, such as baseball and rock music. He asserts that the most important task of secondary education is to teach students how to set up equations that solve word problems.

The Standards warrantlessly claim that word problems are overly repetitious. However, Toom believes that there is actually much greater variety in word problems than in traditional problems. Toom argues that if a teacher’s word problems are too uniform, then that teacher is incompetent. Word problems are valuable because they can be solved in many ways, which encourages ingenuity.

14.18. *A Mathematics Manifesto: Think Differently! Think Quantitatively! Quantitative Awareness as a Fresh Thinking Cap* by Miriam Lipschitz-Yevick

Lipschitz-Yevick argues that quantitative literacy is important. She briefly summarizes some of the more imaginative and promising ideas for improving quantitative literacy education that were presented at a recent humanistic mathematics conference which she attended.

14.19. *Untitled Poems* by Eric Rasyidi and Marshall Sachs

These two poems construct humorous rhyme schemes which show off the fun and joy of mathematics.

14.20. *Art and Geometry: Proportion and Similarity* by Catherine A. Gorini

Gorini talks about some beautiful and interesting geometrical concepts, and discusses how these can be used in visual art. When Gorini delivered a lecture on these subjects, the response was positive.

14.21. *Analogic Thinking in Science and Math* by Martha D. Patton

Traditionally, scientists reject analogic writing except as an educational heuristic. However, analogic thinking plays an important role in the discovery and communication of novel mathematical ideas. Patton recounts some famous mathematicians' and scientists' views on analogic thinking, giving particular attention to Nietzsche's influential assertion that all language is metaphorical. She discusses the recent growth in research on pragmatics and discourse analysis and on the cognitive processing of metaphors.

Patton wanted to test how science and mathematics students cognitively process metaphors. She describes the methodology and goals of an experiment on this subject that she set up. Most of the students struggled to identify potential analogies. All of the students constructed analogies when given the opportunity. Some of these analogies were the "potential analogies" identified by expert readers, and others were analogies with elements of the students' own experiences.

The students felt as though being forced to think qualitatively about calculus revolutionized their understanding of the subject. Some analogies

were viewed negatively. These analogies were either troubling, inaccurate, or overly simplistic. Irregardless, many of the students still felt as though these analogies stimulated deep thought.

Patton found that analogies can work as a temporary bridge between short-term and long-term memory.

14.22. A Collection of Ideas on Systems and Their Extensions by Paul Fjelstad

Fjelstad states that in general, systems are closed entities with rigidly defined rules for inclusion and exclusion. Entities within the system are regarded as valuable and meaningful, while entities outside of the system are derided and ignored. Fjelstad situates this idea in both mathematical systems and in political systems. Fjelstad argues that in both mathematics and society, closed systems need to be extended.

14.23. Book Review: STRENGTH IN NUMBERS by Sherman Stein by Alvin White

White summarizes the contents of Stein's book, and praises it for demonstrating that mathematics is simple, full of fun, and useful in everyday life.

14.24. Untitled Poem by Mae Talle

Talle's poem is a fun and breezy rhyme about doubling numbers.

14.25. An Informal History of Classical Rhetoric for Mathematicians (Plato and Aristotle) by Philip Keith

Mathematicians don't feel the need to defend themselves to anyone else. However, putting up a pleasant public front is important for swaying policymakers and for drawing new recruits into the field. Keith hopes to assist mathematicians in the public arena by providing a brief history of rhetoric and of its relationship to mathematics.

Rhetoric originated in early Athenian courts after the democracy was restored. It eventually became part of standard Athenian educational practices, much to the dismay of many prominent Athenian philosophers such as Plato.

Aristotle's seminal work *Rhetoric* rebuked Plato, elaborating on the different types of rhetoric and their utility. Aristotle argues that rhetoric and dialectic play an essential role in the discovery of truth. Since the Enlightenment, educated thought has focused on scientific reasoning instead of rhetorical reasoning, and as a result many fields of study have suffered.

14.26. Book Review: WHAT IS MATHEMATICS, REALLY? by Reuben Hersh
by Harald M. Ness

Ness heavily praises Hersh's book, which he believes is well-written, stimulating, and insightful. Hersh's book combs through the vast history of the philosophy of mathematics, and synthesizes the best ideas into a coherent, modern whole.

14.27. In Future Issues by Alvin White

White lists some notable upcoming articles.

15. Issue 21. December 1999. ISSN 1065-8297

The cover of [this issue](#) has a few lines of Pascal's Triangle, connected with the article by Alper and Yang (see Section [15.19](#)), an image of Annali Lax, connected with the article by Marchisotto (see Section [15.2](#)), and a grading scheme for a basic math problem, connected with the various responses to an article about teaching from the last issue (see Sections [14.5](#) and [15.6](#)).

15.1. From the Editor by Alvin White

The state department recently endorsed some mathematical education programs, sparking great controversy in the online mathematical community. In California, mathematics education continues to languish in ineptitude, especially for those students living in poverty.

15.2. Anneli Lax: In Memoriam by Elena Marchisotto

Marchisotto pays tribute to the life of Lax, giving special attention to her cheerfulness and her mental strength.

15.3. Teaching a Humanities Course: A Mathematician's View by Bill Marion

Marion taught a discussion-based humanities course on universal themes in literature and philosophy. Many of Marion's mathematical skills readily transferred into humanistic skills. He did struggle with being a moderator and a facilitator as opposed to a lecturer. Marion concludes that mathematics is not a humanistic field. However, he argues that mathematics can and should become a humanity. Many of the strategies Marion developed for teaching his humanities class were also useful for teaching his mathematics courses.

15.4. Word Problems by Don Pfaff

This song, to be sung to the tune of "We Didn't Start the Fire", is about a student who struggles violently with word problems.

15.5. A Response to Dancis by Margaret Schaffer

Schaffer criticizes Dancis (see Section 14.5) and other reformers who do not believe that students need to learn the basics of mathematics. She argues that young students need repetition and individual instruction. She criticizes Dancis for his desire to remove elementary and middle school mathematics teachers' instructional freedom.

15.6. What Else Do We Forget to Tell Our Teachers? A Response to Dancis by Stephen Sproule

Sproule agrees with Dancis (see Section 14.5) that teachers need to be better educated about how to properly assess students' mathematics ability. However, he notes that many of today's mathematics teachers are overworked and do not have enough time to grade well.

15.7. Another Response to Dancis by Ted Eisenberg

In this third response to the article by Dancis in Section 14.5, Eisenberg observes that in many schools, merely maintaining a semblance of orderliness is regarded as a lofty aim.

15.8. *Evaluation in the Mathematics Classroom* by E. Hoosain and B. Naraine

Proper evaluation is essential to mathematics education. Diagnostic evaluations are used to determine students' knowledge base at the beginning of the semester. Formative evaluations are used to provide students with feedback so that they may develop as a student. Summative evaluations are used to determine a student's grade. Feedback is usually not provided for summative evaluation, but it should be.

15.9. *What is the Thing Called "Humanistic Mathematics"?* by Tamar Apel

"Humanistic mathematics" is an open-ended term meant to stir reflection and debate. Some believe that "humanistic mathematics" means that mathematics should be taught humanistically. In other words, the learning environment and teaching strategies used to teach mathematics need to be changed. Others believe that "humanistic mathematics" means to teach humanistic mathematics. In other words, the content of mathematics curricula must be changed. There is no conflict between these two definitions. Hence, the best approach to defining "humanistic mathematics" is to synthesize the two. On the basis of this idea, the authors developed a humanistic mathematics program. It was designed to create a humanizing classroom environment and to demonstrate the links between mathematics and other fields. This is a dynamic approach to mathematics education diagnostics which focuses on the evolving relationship between students and teachers.

15.10. *Mathematics is an Art: The Story of a One-Time Course* by Paul Fjelstad

All creative activity is preceded by an intense period of chaos in the imagination. Mathematics and art are closely related. This idea is alien to most students. Fjelstad developed a course to teach mathematics to students as though it were an art. His grant request for the course was narrowly approved. In the beginning, the course was open-ended and exploratory. Some students felt discouraged by the abstractness and seeming non-applicability of their results. However, some of the results turned out to be useful in high-level physics.

15.11. *A Reflection on the Word Remembering the Word “Word” is Reflexive*
by Paul Fjelstad and Ivan Ginchev

This is a series of quotes about information theory and the development of mankind from the perspective of language itself.

15.12. *Calculus for the Liberal Arts: A Humanistic Approach* by Kathleen Shannon

Calculus is incredibly important from not only a mathematical perspective, but also from a social, cultural, and historical perspective. Thus, liberal arts students should study calculus. Shannon developed a mathematics and culture course for her college. Discussion is an important component of the course. At the end of the course, the students write a paper answering the question “what is calculus?” One student defined calculus as the study of variables instead of constants. Another student defined calculus in reference to its historical development. A third student defined calculus as the minimum mathematics necessary to resolve Zeno’s Paradox, the Area Problem, the Velocity Problem, and the Optimization Problem. Shannon herself defines calculus as a historically significant mathematical approach developed to solve specific problems that were previously unsolved.

15.13. *Ode to Mathematics* by Sandra Z. Keith

Keith’s poem reflects upon the absolute truth underlying the mathematical manipulation of logical symbols.

15.14. *Divisibility: A Problem-Solving Approach Through Generalizing and Specializing* by Rina Zazkis

One day, a student approached Zazkis wishing to know why a divisibility rule for 7 that she had found on the Internet worked. Zazkis decided to turn this question over to the class. Another student discovered that the same rule worked for many different primes. The students proved this rule for 7, and then generalized to all primes except for 2 and 5. Zazkis later discovered a variant of this problem in a number theory textbook.

15.15. *Excerpts From Ivan’s Commandments for Himself* by Ivan Niven

Ivan’s commandments promote objectivity, humility, and dedication.

15.16. *The Role of Values in Mathematics Education* by Murad Jurdak

Jurdak recounts some of his observations in Middle Eastern mathematics classrooms. In the background is the fact that the Qur'an contains mathematically sophisticated tax codes. In another cultural heritage component, Plato's *Meno*, Socrates is attempting to teach a boy basic mathematics. He wonders whether or not the boy's awareness of his own ignorance is positive or negative. During the seventies at the University of Madison, Wisconsin, Jurdak observed some very disorganized and chaotic experimental teaching techniques. All these led him to believe that the values and beliefs of both the teacher and the students shape the manner in which instruction is carried out.

Values are psychological constructs. They are socially shared and contextually derived. Jurdak concludes that values are also cultural products. Therefore, values are a negotiation between the psyches of individuals and the collectives in which they live.

Alan Bishop has reduced the values which shape American mathematics education to three distinct binaries: control/progress, rationalism/objectism, and openness/mystery.

Values shape the stated goals of mathematics education. Values shape the content of mathematical education. Values shape teaching methodology. Values can also shape computer education. Educators and policymakers need to be wary of this fact because computers are often viewed as value-neutral.

15.17. *Book Review: A TOUR OF THE CALCULUS* by David Berlinski by Bernard Fleishman

Berlinski's book spends most of its time on beautiful and abstract theorems, but unfortunately to the point where it neglects the essentials of calculus. Hence the book may be interesting to anyone already well-versed in calculus, but is not suitable as instructional material.

15.18. *Book Review: Mathematical Reflections* by Peter Hilton, Derek Holton, and Jean Pedersen by Ladnor Geissinger

Geissinger recommends this book to all teachers of math and science. He praises it for its bold decision to break down the separation between algebra and geometry.

15.19. Tea Tasting and Pascal Triangles by Paul Alper and Yongzhi Yang

Alper and Yang use a classic problem from Fischer's seminal work, *Mathematics of a Lady Tasting Tea*, to illustrate the properties of Pascal's triangle.

15.20. Roots by Don Pfaff

Pfaff's brief poem is about the square root of three.

16. Issue 22. April 2000. ISSN 1065-8297

The cover of [this issue](#) contains imagery connected with two of the articles contained in the issue. In particular, the cover is described inside as follows: "In this issue Carl Winsløw looks at the relationship between mathematics and language while Dorothy Buerk examines what messages teachers think they are sending to students, as well as what those students are actually receiving."

The editorial staff remains unchanged in this 48-page issue.

16.1. Invitation to Authors by Alvin White

White invites the readers to submit their own contributions to the HMNJ for publication, and describes the process for doing so.

16.2. From the Editor by Alvin White

White describes the increasingly fraught state of California mathematics education.

16.3. What We Say, Our Students Hear: A Case for Active Listening by Dorothy Buerk

Students tend to interpret what their teachers say in a way that is inconsistent with what their teachers meant. Buerk describes mathematical thinking as algorithmic, abstract, formal, well-defined, axiomatically constrained, rational, and analytic. She notes that even though most mathematicians would agree with this description, most students find it to be appalling. Even intelligent and thoughtful students feel excluded from mathematics. Students do not listen when teachers give explanations for mathematical facts because

they are taught to treat all mathematical knowledge as nothing more than algorithms. By relying on students' natural curiosity, teachers may be able to overcome the problematic view of mathematical reasoning that has flourished in recent times.

Buerk describes an alternative form of mathematical reasoning in which problems are related to personal experiences, unambiguous, grounded in concrete language, contextual, narrative, aware of the limitations of both mathematics and students, non-judgmental, and intuitive. Most mathematicians agree that this reasoning style corresponds with the way that they do mathematics. However, mathematicians do not present their work this way. Instead, mathematicians' work is presented in a brutally efficient, streamlined style which demonstrates mathematical perfection.

Buerk argues that mathematicians must begin presenting the intuitive mode of mathematical reasoning in their classrooms, and make efforts for this mode of reasoning to become incorporated into the public image of mathematics. Mathematics teachers should listen to their students' questions and insights. Doing so will broaden their view of mathematics. Teachers' own views of mathematics are transferred to the students, even if the teachers never say anything explicitly.

16.4. Math Induction by Lawrence Mark Lesser

Lesser pens a fun and simple poem about mathematical induction.

16.5. The Word Problem and the Child by Kenneth J. Preskenis

Preskenis argues that elementary mathematics teachers should use word problems at least once a week, exploiting young children's natural language acquisition instincts to build rudimentary problem-solving skills. He argues that word problems can engage young children by emphasizing connectedness with other parts of their life. Preskenis argues that because word problems can be approached in many different ways, they encourage creative thinking. The problem-solving mentality encouraged by word problems eventually develops into an essential life skill. The educational environment for mathematics should encourage respect, teamwork, and what Preskenis calls "volunteerism". Finally Preskenis relates his thoughts to the NCTM Standards.

16.6. *Written to Me Upon Getting a B in Linear Algebra* by Sandra Z. Keith

Keith delivers a series of humorous metaphors commenting on her emotional state after getting a B in linear algebra.

16.7. *The Need for Interviews in the Mathematics Classroom* by Emam Hoosain

Sometimes students give the correct answers, but seemingly for the wrong reasons. In these situations, it is important to talk to students, as this is the only way to understand what is going on inside of their heads. Hoosain argues that regular interviews should be conducted with students. He believes that this will foster communication, provide the teacher with an opportunity to give individualized feedback, and allow the teacher to better understand the mental machinations of their students.

16.8. *A Glorious Constant* by Ze'ev Barel

Barel's poem is a grandiose ode to e .

16.9. *Using Environmental News to Help Teach Mathematics* by Barry Schiller

Schiller argues that teachers should be more concerned about promoting good citizenship than about cultivating good mathematical practice. To this end, using environmental data can develop in students a lifelong interest in statistics and quantitative reasoning. However, if you wish to interest your students in environmentalism, don't rely on environmental problems from textbooks. These are often poorly written, boring, artificial, and ethically dubious. Instead, you should collect your own problems from outside sources. Problems which highlight the role of confounding in statistics are a great way to incorporate environmental data. Schiller notes that large numbers can sometimes be beyond human comprehension. To humanize them, he recommends repackaging them as per capita statistics.

16.10. *Book Review: WOMEN IN MATHEMATICS* by Claudia Henrion by Natasha Keith and Sandra Z. Keith

Natasha Keith states that this book will appeal to all thinkers who are interested in sociology, humanism, and gender studies - not just people interested

in mathematics. Each chapter of the book is dedicated to a particular myth about women in mathematics. Keith found this layout frustrating because in her own personal experience many of the myths discussed by the book hadn't happened. Natasha Keith expresses admiration for the women in the book who succeeded in the face of great adversity, but criticizes their personal lifestyle choices. Natasha Keith chalks this up to a generational divide. She is critical of the book's attempts to mix politics and mathematics. She argues that the two subjects are unrelated, and that it just so happens that most of the women in the book are involved in politics and mathematics simultaneously.

Many of the women felt as though they were treated as women first and as mathematicians second. Somewhat ironically, the book talks almost entirely about these women's struggles with discrimination and very little about their mathematical work, reinforcing the very mode of representation that these women sought to overturn. In the end, Natasha Keith concludes that the book is out of date and overly aggressive in its search for discrimination in mathematics. She states that the book has very little in common with her own mathematical experiences, and questions whether or not we have already entered an age in which female mathematicians are getting the respect and opportunity that they deserve, contrary to what the book states.

Sandra Keith expresses disbelief and consternation at her daughter's inability to recognize the widespread prevalence of discrimination and harassment in mathematics. She believes that role models are important.

16.11. A Tribute to Ramanujan by Mahesh Dube

Dube's ode to Ramanujan features gorgeous imagery and is deeply moving.

16.12. Use Your Head: Mathematics as Therapy by Miriam Lipschitz-Yevick

Lipschitz-Yevick talks about the therapeutic value of teaching mathematics, especially for the elderly.

16.13. Coherence in Theories Relating Mathematics and Language by Carl Winslow

One of the current trends in mathematical research is to study the institutions and interpersonal relations which inform the practice of mathematics.

A second trend in mathematical research is to study the structural connections between linguistics and mathematics. These two research trends have merged under the umbrella of studying the role of natural language in mathematics education.

Mathematics and linguistics are related by their shared history. The two fields are also related to each other because linguistics has borrowed research methodologies from mathematics. Sociolinguistics and language pedagogy are closely related.

Mathematical ontology is inherently inconsistent, and thus an invalid perspective in which to ground metamathematical study. Metamathematical study should instead be grounded in reality, which means that it must be approached from an epistemic perspective by textual analysis in the deconstructionist sense.

Traditionally, linguistic analyses of mathematical texts have been overly prescriptive. Winslow argues that structural linguistics is best suited for the study of mathematical texts because mathematical reasoning is logically constrained. Mathematical texts are especially interesting subjects of linguistic study because they mix natural language with symbolic language. Understanding linguistic competency is crucial to understanding symbolic language in mathematical texts.

The study of mathematical pedagogy can be broken down into three areas: “mathematics acquisition . . . , didactics of mathematics . . . , [and] methodology of mathematics teaching.”

Most studies on mathematical communication in the classroom are invalid because they are inconsistent with a rigorous linguistic framework and fail to establish a methodological paradigm. If structural linguistics, sociolinguistics, language pedagogy, mathematics, metamathematics, and mathematics education are to work together, then there must be a coherent flow of ideas between the six fields.

16.14. Operationalizing Interactive Learning Paradigms Through Cooperative Learning Activities One-Hundred Percent of the Time in Math Classes by Ted Panitz

Many teachers are apprehensive about relying exclusively on cooperative learning because it requires much more dedication and thoughtfulness from

students than lecturing does. In Panitz's experience, the assumptions underlying this fear are false. In Panitz's class, students would attempt to learn the material themselves from the textbook. Then, they would solidify their knowledge by working out problems with their peers. Panitz intervened only when necessary. The process encourages students to take responsibility for their own education.

16.15. Mathematics and Sex by Yan Kow Cheong

Cheong lists analogous concepts and practices in mathematics and sex.

16.16. Imaginary by Mark Lesser

This is a brief poem about imaginary numbers to be sung to the tune of "Imagine" by John Lennon.

16.17. Invitation to Authors by Alvin White

White describes the process for submitting articles and poetry to the journal for publication.

16.18. In Future Issues by Alvin White

White lists some upcoming articles that may interest the reader.

17. Issue 23. September 2000. ISSN 1065-8297

The cover of [this issue](#) is "skin of a leopard", described in the front inside cover as follows: "a sona sand drawing by the Chokwe people of Africa. Paulus Gerdes explores the mathematics behind sona in his book *Geometry from Africa: Mathematical and Educational Explorations*, reviewed by Claudia Zaslavsky on page 65." See Section [17.13](#) for the review.

In this 66-page issue, Bill Rosenthal of Muhlenberg College joins the editorial team as associate editor.

17.1. Invitation to Authors by Alvin White

White describes how the reader can submit their own material to the journal for publication.

17.2. From the Editor by Alvin White

White notes that the conditions surrounding the decision to retain a student for another year in a grade are often ill-informed and arbitrary. He provides some glaringly bad examples of instances in which children were needlessly held back.

17.3. Will You Still Be Teaching in the Twenty-First Century? by Theodore Panitz

Technology can effectively supplement teaching, but is not an appropriate substitute for the face-to-face interaction that constitutes the heart of the educational process. Education is about developing critical thinking skills, social responsibility, comfort with collaboration, and dedication. Peer interaction and collaboration are essential skills that students must develop, and online communication skills are not an adequate substitute. Economic incentives have spurred a misguided rush to incorporate technology into all levels of education. But in the end cooperative learning is what we cannot let go.

Cooperative learning activities engage students more fully than lectures do. Discussion provides students with instant feedback, making it much more effective than graded assignments. Studies have shown that collaborative learning improves the quality of peer editing, promotes oral communication skills, and fosters metacognitive thought. The author continues with many other benefits of cooperative learning.

17.4. The Story of a Service Learning Project: Mathematics in the Park by Joyce O'Halloran

O'Halloran developed a class in which college students developed mathematical games to be played outdoors, and taught these games to local high schoolers. The high schoolers didn't like the games developed by the college students. However, this encouraged the students to develop their own games. When it came time for the high schoolers to teach their games to the middle schoolers, they were nervous and apprehensive. With time and encouragement they became confident. Volunteering at underprivileged schools made a strong impression on the college students who worked with O'Halloran.

The two keys to success for community service projects, according to the author, are commitment from community partners and regular reflective meetings.

17.5. Training Elementary Teachers for the New Millennium by Dixie Metheny and David Davison

Metheny and Davison developed a program called PRIME which encourages students to take control of their mathematics education, discovering and constructing concepts for themselves. PRIME achieves this goal through intensive teacher retraining. PRIME was developed in response to the increased use of technology as an information delivery mechanism in the classroom.

After the first year of the program, the participating teachers expressed interest in constructivist educational philosophies, concerns about their ability to implement it in their classrooms, and awareness of the deficiencies in their own mathematical knowledge.

The program was also tested with students instead of teachers. These students were grown in their teaching abilities as a result of the program.

The program fostered the creation of a community of mathematics educators. The program could have been improved by providing more support for teachers once they had finished the program and by screening the mentors who participated in the program.

17.6. True Prime by Pat Mower

Mower's poem humorously imagines prime numbers as private-eyes.

17.7. The School/Home Communication Project: A Study of the Effect of More Frequent Grade Reporting on the Achievement of High School Mathematics Students by Robert Dean Rogers

This study found that increasing the frequency with which reports of student progress were sent home increased student achievement. Rogers states that his findings prove that families manage their children's academics.

17.8. *Book Review: EXPERIENCING SCHOOL MATHEMATICS* by Jo Boaler
by Stephen Sproule

Boaler's book compares mathematics teaching at two schools, one of which is traditional and one of which embraces progressive ideals. The progressive school seems more effective, and Boaler concludes that open-ended, exploratory pedagogical techniques are more effective than lecturing. Sproule criticizes Boaler for jumping to conclusions too quickly and for her lack of examples.

17.9. *Ode to the Square Root: A Historical Journey* by Dorothy W. Goldberg

Goldberg talks about various methods used to find square roots that were common throughout history.

17.10. *Book Review: KNOWING AND TEACHING ELEMENTARY MATHEMATICS* by Liping Ma by Roger Howe

Many teachers and institutions do not take research on mathematics education seriously. This book should convince them otherwise. Some evidence suggests that teachers who have taken more advanced mathematics courses do not do significantly better at teaching elementary mathematics. Howe suggests that this is because upper-level mathematics is taught superficially and therefore does not enhance students' understanding of lower-level mathematics. In interviews with mathematics teachers from America and China, it came to light that the Chinese teachers demonstrated a much greater depth of understanding than their American counterparts did. Some studies have found superior mathematics achievement in China. This is potentially caused by Chinese teachers' superior mathematical ability.

Advances in technology have made a large portion of contemporary American mathematics curriculum obsolete. Mathematics education should focus less on how to do computation, and more on which computations are necessary in which situations.

Ma identifies three reasons why Chinese teachers outperform American teachers. First, Chinese teachers receive better and earlier training. Second, Chinese teachers are specialists in their field. Third, Chinese teachers' working conditions promote intellectual maturation.

Ma believes that teachers should spend more time preparing lessons than delivering them. Ma also believes that mathematics students should view mathematics as a coherent whole. Howe advocates that mathematics departments and education departments work together to develop a system that resembles the Chinese educational system in certain crucial aspects.

17.11. Senior Seminar: A Capstone Course in the Computer and Mathematical Sciences by Ken Oberhoff and Ron Barnes

Oberhoff and Barnes developed a senior seminar for computer science, statistics, and applied mathematics majors which teaches how to write effectively, how to present effectively, and also on the importance of reflection. The course also addresses ethical issues in mathematics.

The course began as a series of discussions and presentations on readings related to mathematics. Then it eventually evolved into a mix of readings, discussions, essay assignments, oral presentations, resume writing, and colloquiums. Students responded positively to the course.

17.12. Weizmann Day's "Math Night" Brings Parents to Their Knees by Jewish Community News

Weizmann Day's math program exploits children's natural curiosity and delight in the context of problem-solving. On "Math Night", parents were invited to the school to celebrate math with their children. They were blown away.

17.13. Book Review: GEOMETRY FROM AFRICA: MATHEMATICAL AND EDUCATIONAL EXPLORATIONS by Paulus Gerdes by Claudia Zaslavsky

Gerdes' work on ethnomathematics examines symmetry in African textiles, African ornaments, African crafts, and African sand drawings. A couple illustrations accompany the review.

17.14. Qualitative Quantities by Susan Parman

Parman's poem asserts that humans have become so enamored with the quantitative that they have lost sight of the qualitative.

17.15. Number, Infinity, and Truth: Reflections on the Spiritual in Mathematics by James V. Rauff

Even though mathematics is often viewed as the pinnacle of logic, reason, and unambiguity, mathematics also has a very strong spiritual component, as seen in ancient Egypt and Mesopotamia. There are many contemporary cultures which associate mystical power with mathematics as well. Rauff discusses the mathematics of the five-fold and seven-fold chants of the Upanishads of India, as well as the sacred numbers of the Oglala Sioux of the Americas. He also discusses the cosmological worldview of the Ogotemli of France.

Mathematics can provide unity, organization, and framework to otherwise uninterpretable spiritual and divine principles. The awe-inspiring paradoxes and surprises inherent to the notion of infinity demonstrate why one might attribute divine significance to numbers.

Rauff draws connections between immanent truth, mathematical truth, and transcendental truth.

17.16. Skolem's Paradox and Contradictory Popular Songs by Maurice Machover

Machover looks at popular love songs through the lens of Skolem's Paradox.

18. Issue 24. May 2001. ISSN 1065-8297

The cover of [this issue](#) has a mathematical hydra, described in the front inside cover as follows: "The Hydra of Mathematical Impossibility is slain by the Hercules of context extension. This cartoon comes from the book *No Way: The Nature of the Impossible* edited by Philip J. Davis and David Park. Davis writes in this issue on Gödel's Incompleteness Theorem (p. 11)." See the article by Davis in Section [18.8](#).

In this 60-page issue, the editorial team remains unchanged. The Letter from Newsletter #1 is republished (see Section [1.1](#)).

18.1. Invitation to Authors by Alvin White

White describes how the reader can submit their own contributions to the journal for publication.

18.2. From the Editor by Alvin White

White wonders what the best method for informing students on educational progress is. He discusses some of the articles that appear in this issue.

18.3. What "Is" Mathematics? by Gian-Carlo Rota

This is an article written by Rota and sent to colleagues via email to friends on October 7, 1998.

Rota argues that predictive power is not the purpose of scientific inquiry. Philosophers and logicians often disrespect the bountiful power of expression that words possess. Logical reasoning is divorced from everyday reasoning. Philosophers must learn to embrace the paradoxes and inconsistencies which are inherent to their trade. Definitions cannot be written out. Definitions simply orient the reader in a generally correct direction, and with a little imagination the reader grasps the true meaning of the word. Therefore, "mathematics" cannot be defined.

The purpose of dictionaries is to make esoteric words universally accessible to all. When an uninformed person asks what mathematics is, they want a brief, easy-to-understand answer. However, there is no answer that could possibly capture the beauty and diversity of mathematics. Often, mathematicians answer the question "what is mathematics" by talking about specific mathematical facts instead of talking about what mathematics is.

Rota identifies "mathematics" as a pre-ontological term. This means that the word can only be understood in relation to the word "is". To say that A "is" B is to situate A and B in an interweaving mesh of well-understood contexts. Pre-ontological items are free of context, because they are the contexts in which other items are situated.

Rota's conclusion is that we should embrace the indeterminacy of the question "what is mathematics?"

18.4. Hotel Infinity by Lawrence Mark Lesser

This is a song about infinitely countable sequences to be sung to the tune of "Hotel California".

18.5. *A Geometry Course for Prospective Secondary School Teachers* by Jeff Connor and Barbara Grover

High school students should graduate with knowledge of Euclidean geometry, spherical geometry, geometrical software, geometrical axioms, and deductive reasoning. Teachers may struggle to reach these lofty goals because they tend to teach in the manner in which they were taught. Connor and Grover discuss the layout and pacing of a course that they developed that meets these standards. This course is designed primarily to re-educate teachers, but it can also be used for students. The course had a lot of projects and collaborative work. Most of the students benefited from this approach.

18.6. *Tryst of Twins: Antarctica, Amazon* by Arnold L. Trindade

Trindade's poem supposes that the entire biological world is linked by primordial love.

18.7. *Haiku: the Heart* by Arnold L. Trindade

This haiku bridges the gap between the big bang and heartbeats.

18.8. *Naive Thoughts on the Paradox of Gödel* by Phillip J. Davis

Davis lists quotes from great mathematicians, great writers, great philosophers, great scientists, and great thinkers about Gödel's Incompleteness Theorem. He also lists some logical consequences of Gödel's Incompleteness Theorem.

Mathematicians generally disregard Gödel's Incompleteness Theorem because it is an unusable theorem which doesn't reflect the way in which mathematics is actually done. In Davis' undergraduate experience, he perceived Gödel's Incompleteness Theorem as interesting but pointless. Even if a proposition is decidable, it can still be too difficult to solve. But Gödel's Incompleteness Theorem is one of the only prominent mathematical theorems with wide-ranging crossover appeal. The lack of thought on Gödel's Incompleteness Theorem in mathematics demonstrates that mathematics and philosophy are two fundamentally different fields.

Consistency is an absolute necessity in mathematics. Mathematical truth is a fluid notion that has evolved continuously since the beginning of history.

Gödel's Incompleteness Theorem is an essential concept in computer science. Computers are evolving from simple algorithmic computation machines to interactive nodes in learning networks. This reflects a similar motion in mathematics away from deductive reasoning. As deductive reasoning becomes obsolete, so will Gödel's Incompleteness Theorem.

18.9. Problems in Which Given Information is Ignored by Howard Wachtel

When faced with a difficult problem, students will often ignore a piece of information that they were given. Sometimes, students will even substitute their own faulty assumptions for the ignored information.

18.10. The Need to Diversify the Ranks of Teachers of Mathematics by Frederick L. Uy

The demographic composition of mathematics teachers should reflect the demographic composition of their students. Most teachers are female. However, most STEM teachers are male. Very few teachers are racial minorities.

18.11. Be a Part of the Association for Women in Mathematics (AWM) Mentor Network!

AWM seeks to link young women interested in mathematics with eager and willing mentors. Instructions for requesting a mentor and for becoming a mentor are included.

18.12. Educating the Public About School Mathematics by Zalman Usiskin

After the USSR launched Sputnik, there was a massive effort to improve American mathematics education. As a result, extremely ambitious standards for mathematics education were developed. These standards were unrealistic, but encouraged experimentation with and research on mathematics pedagogy. They also promoted a more positive public opinion on mathematics.

During the seventies, a counter-movement known as back-to-basics triumphed over the reform movement. Back-to-basics thought that the acquisition of algebraic skills and minimum competency in mathematics were more important than abstract mathematical knowledge and problem-solving ability. The movement proved to be disastrous for American mathematics education.

In 1983 the NCTM published the Standards. This triggered a return to the ambition and ideals of the fifties.

False signs of failure have led to a strong anti-reform movement which is particularly popular among research mathematicians. They have successfully incorporated their ideas into the Mathematics Framework for California Public Schools. Usiskin criticizes the Mathematics Framework for being overly pedantic and stringent in its definition of a proof and for forbidding the use of calculators prior to grade 12, as well as for ignoring important mathematical developments of the last fifty years, especially in the area of mathematical modeling.

Anti-reformers are concerned that secondary education isn't producing enough high-competence mathematics students, that many college freshmen have to take remedial mathematics courses, and that there is a decreasing emphasis on proof in secondary education. Reformers agree with the sentiment behind this third concern. The available data do not suggest a crisis which would motivate the first concern. The second concern is supported by data, but doesn't reflect a widespread failing on the part of students. Instead, it reflects the fact that collegiate mathematics standards have not kept pace with the times and that students in previously non-mathematical fields now need considerable mathematical knowledge.

18.13. Book Review: THE TEACHING GAP by James W. Stigler and James Hiebert: Review Part I: Mathematics Teaching as a Cultural Activity
by Michael L. Brown

Stigler and Hiebert's book analyzes a statistically controlled random sample of eighth grade mathematics lessons in the U.S., Germany, and Japan. The authors examined the following three questions:

“What methods do teachers use to teach? Does mathematics teaching differ in any significant ways from one country to another ...? And, in the U.S., are high-profile reform recommendations actually being put into practice?”

Teaching methods varied greatly across cultures and very little within cultures. This demonstrates that mathematics education is a culturally controlled activity.

The authors state that the American public's refusal to recognize mathematical education as a cultural activity partially accounts for American students' poor performance on standardized tests internationally. Japanese students perform well on standardized tests. The authors argue that this is because Japanese mathematics education is continuously and organically evolving.

The authors advocate that American teachers be constantly engaged in research on how to improve their lessons. In the U.S., teachers typically show students how to solve problems before assigning them. The authors argue that this pedagogical technique is problematic because it discourages the development of problem-solving ability.

See Section [20.14](#) for the second part of this review.

18.14. Funny Problems by Florentin Smarandache

This is "a selection of original or collected recreational mathematical problems".

18.15. Students and Their Learning From Reading by Chris Fenwick

Students should know how to read technical mathematical and statistical texts. Fenwick added an interpretive element to his problems because it forces students to organize and conceptualize their thoughts. He also developed what he calls Key Element Permutation (KEP) technique. For this technique, a person reorders the elements in a definition to highlight different aspects of it. Another technique that he developed is Key Element Substitution (KES) technique. For this technique, the reader substitutes key-words in a definition with synonyms. Fenwick also developed Key Element Deletion (KED) technique. For this technique, the reader streamlines definitions by removing non-essential components from the text. Finally Fenwick developed what he calls Text Levels Analysis. Students start by analyzing specific sentences, then move on to paragraphs, and then on to pages, and so on until they've analyzed the entire text.

Students gained knowledge from these techniques. Some students stated that their opinion of mathematics had become much more positive.

18.16. *Journal Review: THIRD INTERNATIONAL ANTHOLOGY ON PARADOXISM* by JoAnne Growney

Growney describes the history of the Romanian literary movement known as paradoxism. She defines a distich as a two line poem in which the two lines contradict each other, yet come together in their explanation of the title. Growney lists some of her favorites distichs.

18.17. *Real Numbers, Math Lives* by Arnold Trindade

Trindade's poem is an extended reflection on the metaphysical links between nature, mathematics, and time.

18.18. *In Future Issues* by Alvin White

White lists some upcoming articles that the reader should be excited about.

18.19. *Humanistic Mathematics Network Journal E-Mail List* by Alvin White

White explains how one can subscribe to the HMNJ email list.

19. Issue 25. August 2001. ISSN 1065-8297

The cover of [this issue](#) displays a hand, reaching out to be held and helped. The front inside cover description is as follows: "Giving Math a Hand: Look closely and you can see that the hand is made of the names of different theories and areas of mathematics! Thanks to the brainstorming of her friends, production manager Fess Nelson was able to design this cover after being inspired by S. Robert Wilson's poetic essay (p. 7)." Wilson's poem is in Section [19.5](#).

The editorial team of one editor and ten associate editors remains unchanged in this 48-page issue. The Letter from Newsletter #1 (see Section [1.1](#)) is once again reprinted in this issue.

19.1. *Invitation to Authors* by Alvin White

White invites readers of HMNJ to submit their own poems and articles for publication, and provides instructions on how to do so.

19.2. *Nuclear Magnetic Resonance and Humanistic Mathematics: a Farewell*
by Linley Erin Hall

Hall was surprised to discover that the ideal peak intensities in chemical spectra, obtained via Nuclear Magnetic Resonance, adhere to the properties of Pascal's Triangle. Hall concludes that "humanistic mathematics is ... finding the mathematics that is everywhere".

19.3. *Stairway to Seven* by Lawrence Mark Lesser

Lesser's poem about the number seven can be sung to the tune of "Stairway to Heaven".

19.4. *On the Preparation of High School Mathematics Teachers* by Edna Maura Zuffi

College and university mathematics programs should prepare students for the demands of teaching. In Brazil, most mathematics teachers model their pedagogical techniques off of their high school experiences. Zuffi asked seven Brazilian high school math teachers to state everything that they knew about functions. The teachers only talked about the concepts used in their high school courses. When prompted to go beyond what they teach, all of the teachers simply repeated themselves. The teachers were well-versed in the formal definitions of functions, but struggled conceptually. Zuffi observed three other Brazilian teachers teaching in the classroom. She noticed that they tended to treat algorithms as far more important than definitions.

Zuffi concludes that most of the problems befalling high school mathematics education result from poor teaching techniques being passed on from generation to generation. High school teachers rely too heavily upon textbooks when creating their lessons. Furthermore, they are expected to cover too much ground, and as a result many students never develop mathematical comprehension.

19.5. *Fivefolded Asymmetrical Hand: A Poetic Essay* by S. Robert Wilson

Wilson's lengthy poem is a search for philosophical transcendence and divinity through mathematics. He laments that academia has become a self-contained, mechanistic organization divorced not only from society but also from divinity and philosophical transcendence.

19.6. *The Natural Role of Mathematics in the Sciences: How Maharishi's Vedic Science Answers the Question of the Unreasonable Effectiveness of Mathematics in the Sciences* by Catherine A. Gorini

Mathematics is a product of human subjectivity, whereas reality is a product of absolute objectivity. Gorini argues that the two can be reconciled via Maharishi's Vedic science. The mind and the world are not separate. They are different aspects of the same reality.

Advancements in both mathematics and science can be made by going deeper into one's own consciousness.

Gorini traces the evolution of pure and applied mathematics, concluding with the great irony that many of mathematics' purest and most abstract results were essential to explaining quantum physics and relativity. Maharishi grounds reality in intelligence. Since intelligence is the fundamental property of consciousness, reality is an expression of consciousness. In consciousness, object and subject are united. Thus, consciousness breaks down the binary between subjectivity and objectivity.

Since mathematics is the study of the laws of consciousness, and since consciousness underlies the operation of reality, both mathematics and science are studying the same thing.

19.7. *To Myself* by Abba Kovner

Kovner's poem explains how mathematics has helped her to cope with feeling overwhelmed.

19.8. *What Does it Mean to Understand Mathematics?* by Enamuddin Hoosain

It is universally agreed that mathematics students should understand mathematics, but there is not a universally accepted definition of "understanding". Hoosain lists some indicators of understanding.

19.9. *Galactic Hippodrome* by Arnold L. Trindade

Trindade's poem examines cyclic motions at both the galactic and the human level.

19.10. *Using Guided Inquiry in Teaching Mathematical Subjects* by Stephanos Gialamas, Abour Cherif, Sarah Keller, and Ann Hansen

The authors recount the history of mathematics, and conclude that mathematics is the study of patterns. Guided inquiry might be a good way therefore to teach mathematics.

By promoting active involvement in education, guided inquiry improves students' "ability to analyze, synthesize, evaluate, and relate the intended learning concepts to multiple disciplines and everyday life." Guided inquiry begins with an activity, is followed by a lecture, and ends with a discussion. Initially, students develop conjectures to an interesting question and then test those conjectures. Students then develop a detailed, complete experiment. Finally, students try to generalize their findings. At this point the teacher then introduces the formal concept under study.

19.11. *A Sabbatical Experience: Nurturing a Partnership* by R. Michael Krach

During his sabbatical, Krach established a mathematics club for gifted students at a local elementary school. Many of the students in the program asked him for advice. As his sabbatical progressed, Krach became more and more involved with the mathematics program at the school, and had many positive experiences with the students. Krach concludes that sabbaticals should be used for community outreach.

19.12. *The Pythagorean Theorem and Area: Postulates Into Theorems* by Paul A. Kennedy with contributing author Kenneth Evans

In high school, geometry is not taught as a coherent axiomatic system. Instead, it is presented as a series of interesting theorems and postulates which stand in isolation. In an attempt to rectify this situation, Kennedy lists some basic geometry theorems and then proves them.

19.13. *A Hypnotist Teaches Math: The Effect of Person Centered Math Classes on At-Risk College Students* by Ron Bell

Bell developed a highly successful tutoring course based on the philosophies of Milton and Erickson. The course takes the student/teacher relationship very seriously.

Student resistance is not negative. Rather, it is an action taken to satisfy needs of the student that are unknown to the professor. According to Erickson's concept of utilization, student resistances should be exploited and translated into something that is educationally beneficial.

According to Erickson's idea of "chunking up", students need to leap off of previous successes into even larger successes. Bell primes his students to see failure as a sign of future growth, so that they do not become discouraged when things go badly.

Instructors cannot expect their students to be on the same page as them. They must go to where the student is mentally, and then move forward with the student at an appropriate pace.

By presenting mathematics as a series of intriguing puzzles, teachers can help students overcome math anxiety.

Students must feel validated. They must believe that change and improvement are possible.

Both direct instruction and metaphor are essential tools in an instructor's toolbox.

Instructors can motivate students to complete burdensome tasks by presenting it as an alternative to a far worse task.

A statistical analysis of Bell's teaching methods revealed that they were effective.

20. Issue 26. June 2002. ISSN 1065-8297

The cover of [this issue](#) displays "The Ancient of Days Striking the First Circle of the Earth" by William Blake. As mentioned in the inside cover of the issue, this image had also "appeared in black and white in Humanistic Mathematics Network Newsletter #4, the first printed issue of this publication."

With this 70-page issue an era came to an end. The editorial team listed in the front inside cover was identical to the previous issue, however this was to be Alvin White's last issue as editor. And this was also the last print issue of HMNJ.

The issue contains a handful of standard HMNJ material but also includes an extensive special section (with contributors such as Sandra Keith, Philip

Davis, Annalisa Crannell, Marion Walter, Reuben Hersh, Larry Copes, JoAnne Growney, and Stephen Brown) celebrating this issue. See Sections [20.21](#)–[20.27](#).

20.1. Invitation to Authors by Alvin White

White invites readers of HMNJ to submit their own poems and articles for publication, and provides instructions on how to do so.

20.2. From the Editor by Alvin White

White reflects upon the history of HMNJ. He believes that the original hope of the journal has finally been met, and for that reason HMNJ will no longer be a printed publication. He thanks the readers for their unflagging support.

“When newsletter #1 was published in 1987 it was an act of hope. That hope has been fulfilled by the support and good will of many readers, authors and friends worldwide as well as several program officers of the Exxon Education Foundation and its successors. I am grateful to all. I am also grateful to the presidents and deans of Harvey Mudd College, the chairs of the math department, and the technical staff for their support and encouragement. My gratitude also extends to the generations of Harvey Mudd students who have created the format, typed the articles to be sent to the printer, and performed the essential tasks that converted the authors ideas into print.”

20.3. Comments on Zal Usiskins Article in the HMNJ for May, 2001 by Bob Stein

Stein comments on Usiskin’s article (see Section [18.12](#)). His piece adds more details to the discussion and concludes with a severe criticism of California’s state standards.

20.4. Loopy by George W. Hart

George W. Hart is a mathematician and sculptor who enjoys bringing together his two arts. In this article he describes and displays a sculpture he called “Loopy”. He explains the mathematical considerations that went into his design.

20.5. *History of Mathematics, an Intuitive Approach* by Dr. Alejandro R. Garciadieago

Students often conflate history and chronology, viewing history as no more than a collection of facts. This view neglects history's interpretative aspects. History is narrative. Therefore, the presentation of history is "as important as the raw material . . . itself".

People frequently compare history to detective work. However, unlike historians, detectives do not reconstruct the past, detectives become personally involved in their investigation, detectives are rewarded financially for their findings, and detectives do not have the same standards of rigor and objectivity.

Mathematical historians typically study the evolution, development, and social context of mathematical ideas. Very few mathematical historians study the lives of great mathematicians. Unlike historical narratives, mathematical ideas leave no room for interpretation.

Historical analysis is affected by the experiential background of the historical practitioner. The process of organizing and selecting historical information inevitably shapes historical narratives.

20.6. *Humanizing Mathematics: The Humanistic Impression in the Course for Mathematics Teaching* by Ada Katsap

Mathematics education can and ought to encourage students to think non-adversarially about their own self-interest. Mathematics is viewed as amoral and emotionally detached. Emotionally detached mathematics education cannot bring together students from diverse cultural backgrounds. Teaching mathematical history can help alleviate the anxiety and emotional hostility that often surround mathematics.

Katsap developed a course based on these observations for Kaye College. Students from diverse backgrounds were encouraged to work together during this course. The course promotes confidence, independence, competence, and responsibility. The course included material on Jewish and Islamic contributions to mathematics which many students found very interesting. Katsap's students developed respect and pride for their people's contributions to mathematics.

Humanistic mathematics encourages students to think about how mathematics shapes human society and human thought. It also encourages intellectual respect for other cultures.

20.7. A Brief Look at Mathematics and Theology by Phillip J. Davis

Both God and mathematics are everywhere in our daily lives. However, most academicians have little to no interest in the relationship between these two subjects. Mathematical historians avoid discussing the relationship between theology and mathematics so that mathematics can maintain its gleaming facade of logical positivism. This is “intellectual cleansing”. Mathematicians have increasing interest in theology and decreasing respect for positivist epistemological theories.

Davis summarizes some of the ways that mathematics has contributed to theology and some of the ways that theology has contributed to mathematics. He talks about numerology and about the divine power imbued in basic arithmetical operations. Finally he states that the image of God is present in perfect geometric constructions, especially when those constructions are in either anatomy or art.

20.8. Pat's Prologues: Introctions to the First Two Airings of Math Medley, a Radio Talk Show by Patricia Clark Kenschaft

Kenschaft hosts a weekly radio talk show on mathematics education stationed in Rhode Island. The show has been positively received. Kenschaft founded the show because she wants more people to enjoy math, and also because she believes that widespread mathematical literacy is essential to our future.

20.9. Notes on Formal Constructivism by D. Joyner and P. Lejarraga

“Our hope in this paper is to provide a theory, admittedly somewhat vague, of how we think about mathematics.” (page 28)

The authors explore realism and constructivism as philosophies of mathematics and try to relate them to theories of consciousness and language. The musings here were inspired by *Conversations on Mind, Matter, and Mathematics* by J.-P. Changeux and A. Connes.

20.10. *Calculus* by Sarah Glaz

Glaz offers a poetic story of the history of calculus in colorful imagery, focusing on Newton and Leibniz.

20.11. *Marcy's Dots: A Problem on a National Test Revisited* by Patricia Baggett and Andrzej Ehrenfeucht

The authors revisit a question that was part of a national eighth grade assessment. They demonstrate that the question has many possible solutions, and criticize the test makers for accepting only one answer.

20.12. *Aphorisms* by Lee Goldstein

Inspired by Husserl, Goldstein lists a series of quotes meant to bypass our internal grammar and open up for us the programmetrical structure of the world at an intuitive level.

20.13. *When is a Math Problem Really "Real"?* by Dr. Michael E. Goldberg

In math classes, students often ask "when am I ever gonna use this?" Goldberg discusses some responses that other authors have given to this question, most of which were inadequate and pedantic. Even if word problems are based on real world data, the problems aren't necessarily any more interesting to students.

Goldberg takes a different approach and argues that you can never know when you are going to need specific knowledge, so the question itself is pointless. He illustrates this point with several examples. He defines a humanity as a field which promotes the development of human culture. Students need to know mathematics because it is an essential part of human culture.

20.14. *Book Review: THE TEACHING GAP by James W. Stigler and James Hiebert: Review Part II: Contrasting U.S. and Japanese Beliefs About Mathematics Teaching* by Michael L. Brown

This is the continuation of a book review published in an earlier issue, see Section 18.13.

Stigler and Hiebert's book proposes that the origin of teaching ability is culturally specific mental teaching scripts. In the U.S., mathematics is seen as an uninteresting set of procedures for solving problems. The book traces

this view back to Skinner's behaviorist psychology. Teachers fail to see the fundamental problem with American mathematics education, and instead try to maintain students' interest through pseudo-mathematical diversions.

The book observes that frustration is regarded as natural in Japanese mathematics education and as a grave sign of failure in American mathematics education. American teachers tend to baby students. Japanese teachers invite students to take an active role in their own learning. Only in America is the wide variability in student abilities viewed as a detriment to education for all.

20.15. Review of JoAnne Growney's MY DANCE IS MATHEMATICS by Sally Lipsey

Lipsey praises Growney's insightful, clever, well-written, expressive, and relatable poems.

20.16. Portfolio Assessment in Liberal Arts Mathematics by Mike Kenyon

In some of his courses, Kenyon's students put together mathematics portfolios. The first part of this portfolio is a collection of word problems. The second part of this portfolio is a reflective introduction. The third part of this portfolio is a review of the book Fermat's enigma. The portfolio assignment is independently guided. The quality of work that students hand in is consistently excellent.

20.17. "Magic in a Box" Excerpted with Permission From the Magic of Math by Lacie Juris

Juris was dazzled by the rich history surrounding the magic square.

20.18. Divisibility: a Problem-Solving Approach Through Generalizing and Specializing by Rina Zazkis

This article is reprinted from Issue #21. See Section [15.14](#).

20.19. Equation Story by Whitney Perret

This is a humorous story about a family which lives in "Number Land". The story discusses basic algebraic facts and techniques. It was written by Whitney Perret, a student in Margaret Schafer's 7th grade math class.

20.20. Does a Mathematical/Scientific Worldview Lead to a Clearer or More Distorted View of Reality—Purposive Musings Inspired From Readings in the URANTA Book, the Cosmic Family Volume I, and Elsewhere by Jeru

Due to the secularist response to the Christian overreach in medieval times, many are now too quick to accept scientific postulates as fact. In scientific analysis, the possibility of God's existence is implicit in the great uncertainty of the scientific process that is routinely ignored by scientists. Jeru concludes that scientists have agendas, and that these agendas manifest themselves in their work. Jeru notes that these agendas usually promote a mechanistic view of mankind in which humans are little more than mathematical symbols toiling away to no end. Jeru finds this philosophy disgusting and devoid of hope.

20.21. Special Section: On the Publication of the 26th Issue of the Humanistic Mathematics Network Journal by Sandra Keith

The special section of this issue starts here on page 59. Keith narrates the history of humanistic mathematics from the fifties to the present day. She comments on the gains that have been made in mathematics for women and minorities, on the increasing role of technology in mathematics, and on the relationship between pure and applied mathematics throughout the years. She thanks Alvin White for his dedicated service.

20.22. Alvin White and the HMNJ by Philip J. Davis

Continuing in the special section celebrating Alvin White and HMNJ, Davis reflects on the roots of his friendship with Alvin White. He praises Alvin White for having the dedication, insight, and fortitude of thought to create the HMNJ. Davis argues that due to the increasingly important role of mathematics in society, humanistic mathematics is more important now than it has ever been before. In Davis' vision for the future of the HMNJ, there are more pieces addressing mathematics in everyday life and less pieces addressing mathematics education.

20.23. Reflections on the Founder by Annalisa Crannell

Crannell continues the special section with a reflection on her first meeting with Alvin White at a conference that he organized in which she was a panelist. She praises him for his passion.

20.24. *On the Twenty-Sixth Edition of the HMNJ* by Marion Walter and Reuben Hersh

Still continuing the special section, Walter denigrates the HMNJ's new online format. She praises the HMNJ for being one of the only journals in which highly thoughtful and reflective articles on mathematics can be published. She talks about some of the journal's and Alvin White's best works. She then presents a poem about HMNJ in which the first line begins with A, the second line begins with B, and so on. Hersh notes that founding a journal and editing it is tedious, tiring work, and thanks Alvin White for his many years of dedication to the HMNJ.

20.25. *Humanistic Educational Mathematics* by Larry Copes and JoAnne Growney

In their contribution to the special section, Copes and Growney explain how in the beginning, there wasn't any consensus on what the term "humanistic mathematics" meant. Some viewed it as a recognition of the cultural and societal role that mathematics plays, while others viewed it as a teaching philosophy that treats students like human beings. Copes believes that humanistic mathematics is actually an attempt to humanize a field that is traditionally cold and calculating. He is skeptical of the political side of humanistic mathematics, but believes that mathematics education has been evolving humanely and will continue to do so in the future. Growney praises HMNJ for being a journal in which highly interesting articles can be published. She includes a poem by Miroslav Holub and one of her own poems.

20.26. *Teaching as Though Students Mattered: A Biography of Alvin White as Told to Sandra Keith*

Alvin White recalls his martial and educational history. He speaks fondly of an extensive paper he wrote on the history of public housing in New York City. He talks about a course he taught early in his career called Calculus of Variations. He held the course in his living room and taught it in a student-centered fashion. Students liked the course, but didn't feel as though they'd learned as much as they could have. He published an article on his experience. White took a seminar course at MIT in which he and other university members had open-ended discussions on a wide variety of topics

from mathematics, philosophy, and science. The participants were very close by the end of the semester.

White was disappointed by the lack of community in HMC's mathematics department. Thus, he taught a course in which there were readings from multiple textbooks on each topic, and also readings from J Bronowski's book *Science and Human Values*. Students were encouraged to develop their own problems, and to solve problems generated by other students. Exams were cooperative.

He and five other Claremont Colleges faculty received a grant to become interdisciplinary scholars. This grant ended up mainstreaming some of White's nascent thoughts on humanistic mathematics. This led to the publication of an issue of *New Directions in Teaching and Learning* called *Interdisciplinary Teaching*, a precursor to the HMNJ.

Then White received a grant from the Exxon Foundation to pursue humanistic mathematics. He decided to publish a newsletter with the money. As the newsletter became more well-distributed, it became more professional. Conferences on humanistic mathematics began to spring up all around the nation.

Alvin White closes with some quotes from one of his favorite books of all time, *Personal Knowledge*, by Michael Polanyi.

20.27. Humanistic Mathematics: Personal Evolution and Excavations by Stephen I. Brown

This is an introduction to Brown's upcoming article in issue #27 (see Section [21.12](#)). He praises HMNJ for bringing together a plethora of distinct disciplines. He plans to situate the evolution of his own writing on humanistic mathematics in this cooperative environment.

20.28. Letters and Comments by Dick Tahta

Tahta criticizes authors who talk about metaphysics in the context of mathematics for being tautological, needlessly long-winded, and off-topic. He also criticizes authors who insist that mathematical word problems need to be completely realistic.

20.29. Humanistic Mathematics Network Journal E-Mail List and Website

This section instructs the reader on how to subscribe to the HMNJ email list. It also discusses some details of the future HMNJ website.

21. Issue 27. Spring-Winter 2004. Online Issue

This issue was published online exclusively, see [here](#) for the record of the original site. The current location of the archive is <http://scholarship.claremont.edu/hmnj/vol11/iss27/>. The editors of this issue were Sandra and Phil Keith of St. Cloud State in Minnesota. There is a note from Alvin White on top of the page which concludes with:

“On a personal note, publishing HMNJ has been a fifteen year peak experience. I am grateful to those who contributed to and supported the journal.”

21.1. Some Thoughts on the Teaching and Learning of Mathematics by Alvin White

It is essential that students are actively and creatively involved in the learning process. Otherwise, American mathematics students will fall behind their international peers.

21.2. Is Mathematics Education Taking a Step Backward? by Frances Kuwahara

Educational policy is deliberately designed to maintain existing socioeconomic and racial power relations. Humanistic mathematicians have been working to overturn the white male stranglehold on mathematical knowledge. The California educational board developed their own standards for mathematics pedagogy that are contrary to the recommendations of the NCTM. The Californian standards are too skill-centric.

21.3. Humanistic Mathematics Teaching Can Make a Difference by Robert Haglund

Most mathematics teachers teach procedural skills exclusively. This prevents students from learning to think mathematically. As a result, students hate

mathematics. One of the causes of this problem is that many mathematics teachers are ignorant about and don't enjoy mathematics. Another cause of this problem is that mathematics courses are viewed as little more than gateways to more advanced courses. Yet another cause of this problem is that teachers need to cram too much material into too little class time.

On the other hand mathematics is one of the cornerstones of modern society. This fact is not conveyed to American students.

Political solutions to the problems facing American mathematics education tend to rely on examinations. They also tend to be ineffective. The root cause of bad education is the lack of student motivation.

Haglund developed a remedial mathematics course for his college based on Alvin White's pedagogical philosophy. The course improved students' attitudes towards mathematics.

Haglund also offers a list of the features of a humanistic mathematics classroom:

- Placing students in the position of inquirer, not just a receptor of facts and procedures;
- Allowing students to help each other understand a problem and its solution more deeply;
- Learning numerous ways to solve problems, not just an algebraic approach;
- Including historical background showing mathematics as a human endeavor;
- Using interesting problems and open-ended questions, not just exercises;
- Using a variety of assessment techniques, not just judging a student on his/her ability to carry out memorized procedures;
- Developing an understanding and appreciation of some of the great mathematical ideas that have shaped our history and culture;
- Helping students see mathematics as the study of patterns, including aspects such as beauty and creativity;

- Helping students develop attitudes of self-reliance, independence and curiosity.
- Teaching courses from a twentieth century perspective at the university level, so students have a grasp of the mathematics that is being used today in science, business, economics, engineering, etc.

21.4. *Taxicab Geometry as a Vehicle for the Journey Toward Enlightenment*
by Neil Greenspan

Greenspan's article rigorously examines taxicab distance problems.

21.5. *Tesselland* by Martin Glover

This is a "sci-fi short story retelling of a vision about an eccentric old professor's quest to produce life and how a few of his bright students are drawn into his pursuit-turned-dilemma".

21.6. *Popular Cultural Portrayals of Those Who Do Mathematics* by Carmen Latterell and Janelle Wilson

In popular culture, mathematicians are presented as insane, socially inept geniuses. Comics often depict students struggling with outrageous mathematics problems. The students in comics who do successfully complete mathematics problems are usually depicted as odd. In children's television shows, the characters who like mathematics are nerdy. The movie *A Beautiful Mind* might mislead viewers into believing that paranoid schizophrenia is indistinguishable from mathematical thinking. In popular films, there are no incidental mathematicians. Characters are only mathematicians if mathematics plays an indispensable role in the plot. In literature, authors will often make minor jabs at mathematics. When students are indoctrinated by popular media into accepting negative views of mathematicians, they become uninterested in mathematics. This harms mathematics performance nationwide.

21.7. *Bridging to Infinity* by Mike Pinter

Calculus changed Pinter's life by imparting new ways of looking at infinity to him.

21.8. *Man's Cards and God's Dice* by Elie Feder

One of Feder's students asked an excellent question about probability. Feder's struggle to answer her question eventually lead her to important topics in quantum mechanics and Einstein's theory of relativity.

21.9. *A Linear Perspective to Art* by Sarah Littler

Littler's paper looks at the history of perception in representative art. She devotes most of her attention to the period in time when mathematics began to inform representative art.

21.10. *Mathematics, the Liberal Arts, and Slavish Devotions* by J. D. Phillips

In Ancient Greece, mathematics was the foundation of all learning. The political pressures on mathematics educators are suppressing the freedom that is crucial to a true liberal arts education. The practice of mathematics differs greatly from the teaching of mathematics. There is tension in mathematics education because nobody cares about the problems in problem sets. This tension can be resolved with research projects and with readings of seminal texts.

21.11. *What Are Mathematical Problems?* by Emam Hoosain

Hoosain compiles opinions from policymakers, teachers, and students on what constitutes a problem. He concludes that

“A problem is a task or experience which is being encountered by the individual for the very first time and, therefore, there is no known procedure for handling it. The individual has to design his/her own method of solution drawing upon the various skills, knowledge, strategies, and so forth, which have been previously learned.”

21.12. *Humanistic Mathematics: Personal Evolution and Excavations* by Stephen Brown

Brown comments on the “structure of the discipline” movement in the early seventies. He believes that the best mathematics problems can be understood in terms of deep connections.

Isomorphism and equality are essential mathematical concepts that inform all aspects of human existence.

Although elegance is a slippery term, it is essential to explaining mathematics' appeal.

Mathematics is not only about solving problems, it is also about posing problems.

The reasons why we practice mathematics inevitably shape the field into astounding new forms.

Pseudo-history, personal history, and anecdotal history are all important parts of understanding the evolution of mathematical thought.

Mathematical education is characterized by problem-solving. This reproduces an educational meta-ideology which reinforces problematic and anti-humanistic modes of mathematics pedagogy.

Mathematics is more than just a model of the world. It is itself messily involved with many other fields of personal and professional interest.

What counts as mathematical knowledge is culturally and socially controlled. The Talmud is a great mathematical book.

21.13. A Brief Look at Mathematics and Theology by Philip J. Davis

This is reprinted from Issue #26. See Section [20.7](#).

21.14. Humanistic Mathematics as Mathematics for All by Michael Fried

Although everybody has intellectual limits, most people are capable of learning at least some amount of advanced mathematics. Throughout history, many humanists opposed universal mathematics education. Mathematics is useful and leads to a way of thinking that highlights important facets of the universe beyond one's self. In a democratic society, there is a strong argument to be made for universal mathematics education. If one does not understand mathematics, then they are detached from the natural world and suffer a loss of dignity.

Mathematics should be taught through great works of mathematics instead of mathematics textbooks.

Mathematics is a deeply human endeavor.

21.15. *Innumeracy and its Perils, Numeracy and its Promises* by Ramakrishnan Menon

Numeracy is necessary to function in modern society, especially in the areas of law and statistics.

21.16. *Book Review: FERMAT'S ENIGMA by Simon Singh* by Matthew Becker

Fermat's Enigma is a harrowing tale about the life and times of Fermat and how his last theorem came to redefine the field of mathematics.

21.17. *Base and Subbase in a Number System* by Walter S. Sizer

Sizer summarizes some linguistic and mathematical properties of base/subbase numeric systems across the globe.

21.18. *From Art and Architecture to Mathematics* by John Pottage

Pottage's article talks about the role of mathematics, in particular geometry, in art and architecture throughout history. He uses this as an example of how a layman can become interested in mathematics.

21.19. *Are You a Quantitative or Qualitative Runner? 5.13 Miles and Rosemary-Lilac Shampoo* by Shelly Sheats Harkness

Harkness frames her love of mathematics — in all its elegant precision and undefinable glory — in terms of her love of running.

21.20. *Poems* by Marion Cohen

This online issue ends with a collection of poems from Marion Cohen. Here is one of them:

“When you need more than you prove, it’s a nightmare.
When you prove more than you need, it’s unnerving.
You don’t need more
than one revelation.
You don’t need more
than one excuse.”

22. The HMNJ Corpus

The corpus of the HMNJ was completely digitized in an extensive project. Librarian Allegra Swift, then of the Claremont Colleges Libraries, helped organize the process and student workers Kimberley Africa and Tiffany Zhu worked tirelessly for weeks at a time to bring the archive to completion. We hope that our report will encourage more people to access and explore this newly available resource (find it at <http://scholarship.claremont.edu/hmnj/>). Readers of the *Journal of Humanistic Mathematics* will find many kindred spirits among the contributors of the HMNJ.

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