

## T-Shirts Recovered

The T-shirts have been recovered, and are again on sale in the Mathsoc office for \$2.25. There are still some left with the old design, and these are only \$1.75.

## BLOOD DONOR CLINIC

The semi-annual Red Cross Blood Donor Clinic will be held Tuesday, March 9, and Wednesday, March 10, in the third-floor lounge. Come out and *bleed for math!*

## Vandalism

The fifth-floor terminal room, MC 5172, contains ten 2741 typewriter terminals. On Sunday morning, somebody with a knife slashed the carrier return cords on each of them, thus putting them out of action.

Keys to this room are issued to graduate students and faculty members.

The fire-bug who was infesting the Math building seems to have either moved or spawned. Last weekend, great quantities of smoke were observed billowing from the PSY. building. The presence of fire trucks, and unconfirmed reports from denizens of that area, lead us to believe that the fire was deliberate.

## DEC Presents:

### State of the Art in Computer Technology II

Topics: [1] Distributed processing in computer networks. [2] Graphics display & technology. [3] Impact of emerging technologies.

#### Guest Speakers

From the Research & Development group of Digital Equipment Corp., Maynard, MA.:

*Dr. Dave Nelson*, manager of advanced development; and *Dr. Mark Sebern*, project leader.

That's today, Friday, February 27, from 2 to 4 p.m. in EL 101.

FRIDAY, FEBRUARY 27, 1976  
ISSUE A.6

# math NEWS

## Honeywell Accounts Policy Clarified

Recently there have been complaints that the dollars of resources on the Honeywell allocated to students for certain computer science courses are inadequate for the work required, and the other hand there has been a sharp increase in unjustified requests for additional resources. Any charging scheme is, in part, a way of distributing a scarce commodity, and, in the present overloaded situation, computing is a scarce commodity. The purpose of this note is to explain how the available computing on the Honeywell is distributed.

Computing is expensive. The cost of running the Honeywell operation—hardware, payments, maintenance, salaries, supplies, etc.—is about \$40,000 per month, and when the machine is running flat out, as now, the total resource dollars charged by the accounting routines (other than the resources consumed in the operation of the service) is slightly over \$40,000 each month. In other words, the *resources used* message printed at logoff isn't "funny money"—that's what it really cost the Faculty of Mathematics to provide your TSS session. (Nevertheless, compared to elsewhere, computing at Waterloo is cheap. The rates quoted in *Explain Charges Math* are about one-tenth of commercial rates in Toronto for the same services.)

Because computing is expensive and the amount available is limited, it must be allocated carefully. The Faculty of Mathematics has decided that accounts, and resources, are available to faculty

members for research and for course administration and development, to graduate students for research and for coursework, and to undergraduates for coursework and supervised projects. (In the beginning there was enough spare capacity to support unsupervised projects too, but this is no longer practical.)

The only way to control the amount of computing so the machine will be shared fairly amongst its users is to give out resources sparingly, adequate only for the particular purpose intended. For courses, resources are allocated on the basis of the instructor's estimate of what will be required. This estimate might, of course, be insufficient, and in such case adequate supplementary resources will certainly be provided. But resource consumption significantly in excess of the norm for a course will certainly be scrutinized carefully before granting additional resources.

If you are keen, and want to do something other than what is required for your courses, the way to do it is to find a faculty member willing to supervise a project. Many faculty members have projects associated with their research which they would like done, or are willing to supervise the production of some software that would be generally useful to everyone, or might be willing to sponsor and supervise some specific project you suggest. Resources will be made available for such cases.

W. Morven Gentleman  
Director, MFCE

## Coffee & Donuts needs help!

Believe it or not, it takes a *manager* and an *assistant manager* to run this wonderful organization called the University of Waterloo Mathematics Society Coffee Club. Now that you all know that these positions exist in our beloved Faculty (Mathematics, that is). You should also know that these positions are open for the coming summer and winter terms. This means that we need four people - two for the term from May 1976 to August 1976, and two for the term from September 1976 to December 1976.

If you are interested in either of these positions, please forward any questions about them, or if you have no questions, a short resume of what you think are your qualifications for either the job of manager or assistant manager to:

Joe Lifshitz, Manager  
Coffee and Donuts  
MC 3038  
University of Waterloo  
Waterloo, Ontario  
N2L 2G1

A couple of things that should probably be noted are: (1) a written description of the duties (*and pay*) for these positions will be made available on demand (2) these are not trivial tasks!

JJ Long

A committee investigating the Federation privilege card system has recommended, essentially, that those receiving the cards should go on receiving them. The only major change recommended involves replacing the cards Fed councillors get with a \$25 honorarium. It seems like they might as well give them the cards instead, as many people in less important positions will still receive the cards. A chance to fundamentally reform the privilege card system has been passed up by the committee. They retained a two-card system, where people still have a number of different cards to contend with. Also, some people get free admittance for a guest and others don't.

A number of new ideas could have been tried, if the cards should ... kept. All cards should be limited to the user only and should be honored only at events where the price of admission is under \$2.00. This would save the Federation money, and limit a lot of the elitism associated with these cards. Also the cards could be limited to the ten people or so in the Federation and Societies who really need them; other people could submit their expenses to a committee who would decide if they deserve a rebate for attending an event for reasons other than pleasure. If you are interested in this topic, please attend the General Meeting of the Federation, where some of my proposals will be discussed.

The Annual General Meeting of the corporation of the Federation of Students will take place on Tuesday, March 2, 1976. All students who pay the Federation activity fee are allowed to vote. I hope many of the readers of this newspaper will turn up. I have submitted bylaws regarding changes in the Board of Entertainment and the Board of Directors, in order to make those groups more responsive to the students. I have also proposed a more liberal council proxy policy. Other bylaws and the privilege issue will also be on the agenda. There is a group of people who have tried in the past to disrupt Federation activities; though this group did not win any seats in the recent elections, they may try to use their influence by filling the General Meeting with their supporters. I urge people who oppose the tactics of this group to attend the General Meeting as a counter-vailing force upholding our democracy. The General Meeting and the council meeting following it promise to be interesting events. I hope to see you there.

Hopefully the new council will achieve quorum more often than this year's crew.

## Letters to the Trob

For a variety of excellent reasons, there is no regular "Trob" article this week. There was, however, sufficient correspondence to warrant a "Letters" column. There is even a *COMPUTER-OF-THE-WEEK* (see the second letter). But first, some tictactoe feedback:

Dear Trob:

I have written a tic-tac-toe game which takes turns, never loses, and it can be terminated by entering -1. It is written in fortran. One bad point is that the entire board must be filled before it goes on to the next game. It takes 13 links of space to store.

L. E. Connell

Dear L.E.C.:

Thank you for letting me know. I am sure that, if you can get that bug out, people would be glad to have it on the system. Keep up the good work!

Exil Q. Trob

Dear Trob:

I have a nomination for "*COMPUTER-OF-THE-WEEK*"!! I speak, naturally enough, of the WIDJET system.

This system is exemplary, in that it typifies the way in which 2 computers and about 35 CRT's can be put together to make the most bugs.

It seems that the form of unholy matrimony ensuing between a PDP-11 and an IBM 370 (*unless it's a 360 under false pretenses*) can only result in the creation of bugs.

Witness the story of one poor user of this system. Full of joy and eagerness, this young lad, whom I shall call "Ferman" (for lack of a better name), had written the programs for his WATBOL assignment on the weekend. He arrived, raring to go, at his tutorial on Tuesday. He cracked his knuckles, gave a little chortle, and proceeded to attack (figuratively speaking, of course) the terminal. He typed in his userid and the four-letter word cutely called "PSWD-" and got down to business. He called upon the magic letters "DEA" and behold, cometh back the answer:  
ARCHIVE SYSTEM UNAVAILABLE

Ferman recoiled in horror, but bowing before no man, quickly took out his favorite piece of chewing gum and smeared it on the screen. "DEA" he typed again. It worked! Ferman smiled a triumphant smile and started inputting data.

But the great hybrid god IBMPDP (how you pronounce that I wouldn't know!) was not vanquished. Seizing the most opportune moment, when our illustrious hero was listing his file on the printer, it deftly inserted some junk of its own into the middle of the file.

Ferman stared in horror, as the dump continued over 27 pages of output. Then, sniffing bravely, he lowered himself carefully into his chair to delete ... offending lines. Quick as a crash (er, that should be flash) his fingers spelled out the fatal words:

DEL 10027

He held his breath in expectation. He turned blue in the face. His brows furrowed in puzzlement. He let out a deep breath. He cursed. He pounded upon the keyboard in rage.

Half an hour later, he raised his head from the keyboard and stared the CRT in its electronic eye. Suddenly, he burst into bitter tears and fled upstairs to the security of the 'bun.

*You too* could suffer such a fate. Be sure to make the proper sacrifices and reverences before approaching the mighty WIDJET!

J. W. B. MacAulay

Dear J.W.B.MacA.:

I can sympathize with your problems. The last I heard, there were *three* computers running WIDJET: the PDP-11 imitating the CMS editor, the 370 imitating one or more disk drives, and the 360/75 imitating a processor.

A host of other strange stories have drifted up from WIDJET. For instance, some unusual things have been happening because which disk your current files are on depends on whether your terminal has an odd or even number.

Exil Q. Trob

Th-th-th-tha-that's all, folks!

## Sound Off

### Copier Ripoffs

If any of you have been in the EMS library lately, you may have noticed that the only copiers available are Xerox copiers. These are okay for books, magazines, or dark-black pencil or pen notes. But it is almost impossible to copy your room-mate's blue ink scratches or the Prof's blue "ditto" stencil notes.

The librarians say that the other smaller copiers they once had have been replaced because they required more frequent maintenance. However, they do admit that many students have been inconvenienced by this approach (the more so because there are *no* signs to indicate the copying problem). Also, the library refuses, without a big fight, to refund the money of its copier victims.

The library has installed "comment" boards in the EMS and Arts libraries. I urge library users to make use of them, and

*Caveat copier!*

The Saint



## GRID COMMENT



- α Those who don't believe in recursion?
- β Early Teutonic alphabet.
- γ  $1 + 1 = 2$ .
- ε Peduncle.
- ζ Singular of  $((\alpha \rightarrow) \cap (\beta \downarrow))$ ?
- η She comes before Lisa.
- θ  $\perp$  lie.
- ι Point of abbreviation.
- κ What's a year in Paris?
- λ You, objectively.
- μ Here in January.
- ν Mayhap.
- ο Lucifer of Asgard.
- π Stainless or magnetic anagram.
- ρ Complete check (Snob.)
- σ Elizabethan seat.
- τ \_\_\_ th lkng glas.
- υ Fault \_\_\_ fault.
- φ What a lemma is when it grows up?
- χ Permanent-\_\_\_.
- ψ Primate a sailor would agree with.
- ω Necessary and sufficient.

This week we received 14 submissions, 3 of which were correct, plus 1 late submission which was incorrect. This is quite good considering there were five mistakes in the *Gridword* last week: two unblacked squares, one misspelled clue, one misspelled answer, and one misnumbered clue.

Many people had trouble with the color *rubican*, and even more failed to interpret the double clue for *CLR* correctly (the answer *CLeaRly* refers to the former Central London Railway).

All three correct submissions were from people who have won *Gridwords* before. Our randomly selected winner is **David Taylor**

who can pick up his T-shirt certificate at any regularly scheduled **mathNEWS** production meeting.

This week we are bringing you another gridword on a torus. However, this one is a 2-dimensional continuous helix. What that means is that each row is continued on the beginning of the next row and each column continues on the beginning of the column next to it. The last row is continued onto the first row and the rightmost column continues onto the beginning of the leftmost column. As with last week's gridtorus, solutions may be submitted on a C&D donut. Maybe someone will try it this week.

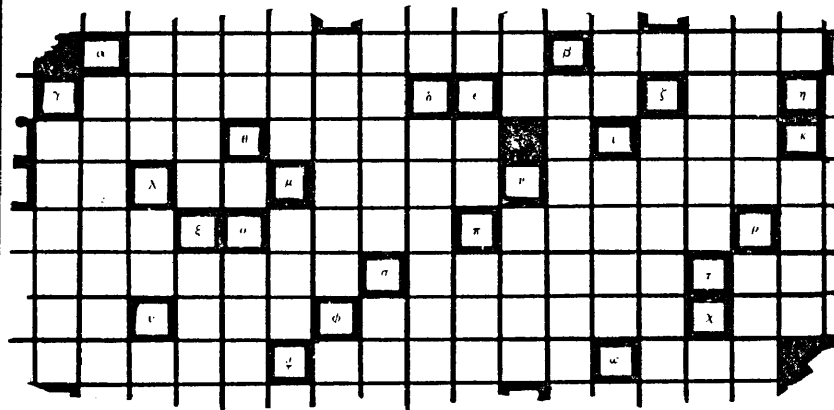
	P	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	A...
0	E	E	N	S	T	R	E	E	T	C	O	S	G	R				
1	T	E	N	R	E	A	H	O	Y	B	E	A						
2	L	E	T	E	A	T	R	U	B	I	C	A	N					
3	U	N	R	E	A	L	T	D	O	T	U	N	I					
4	I	S	A	M	N	A	D	I	R	D	E	C	A					
5	I	P			E	V	E	N	I	N	G	S	S	L				
6	S	C	L	R	V	I	V	I	D	L	Y	C	I					
7	E	S	A		V	I	C	I	O	U	T	R	A	G				
8	E	M	M	E	L	D	E	E	R	B	O	R	N					
9	D	E	P	R	E	S	S	E	D	S	I	C						
:	E	D			O	R	T	H	O	N	O	R	M	A	L	I	Z	
;	T	W	O		H	U	N	D	R	E	D	O	N	E				
<	S	I	N	S	E	T	S	E	D	S	N	O	B					

By Randall S. McDougall and Mark S. Brader

- α Illation.
- β Those who go where no man has gone before.
- γ Dung!
- δ Did Mulroney or Wagner win?
- ε Data specification card (IBM).
- ζ mathNESS [sic].
- ι Hireling.
- κ Burloaf is.
- λ An article from Spain.
- μ Trail.
- ν Bane of Paris.
- ξ What a bull might be after attempting to jump a high fence.
- ο Core groups of the regiments.
- π Male-snake (hyphenated).
- ρ Too Painful to Find a Clue.
- σ A rope passed over a mast and attached to a tackle for hauling up or lowering a yard-sail.
- υ Wander.
- φ Irruption.
- χ Estuary.
- ψ What's done.

Name,  
#,  
etc.  
:

Grid created by Randall S. McDougall and Mark S. Brader *again*. Why don't you create one? We give T-shirts to grid creators...



# BURLOAF

This month's Paperwaster award goes to Mathsoc. First of all, there's the Mathsoc member who is also a member of Watsfic. He decided to help with publicity and ran off an inch-thick listing consisting of signs that said "Westworld is coming...". A reasonable amount of publicity is necessary, but this number of posters seems somewhat excessive. Add to this, the fact that this voluminous poster campaign represents only phase 1 of the advertising program for Westworld.

(After having seen Westworld, in my opinion it will be a letdown after all the publicity.)

The other Mathsoc Paperwaster I saw in action was the person who ran off an unknown, but large, number of copies of the Mathsoc constitution. The printer output was at least three inches thick. It would have been more if the system hadn't crashed during the middle of the printing. Probably most of the constitutions, though intended for great purposes, will serve as mats to catch coffee spills.

It has been reported somewhere that somebody at the University of Guelph did an experiment to see if placing plants under pyramids would cause them to grow faster, to larger sizes, as is claimed by some people. It turns out that the pyramids had no effect on the plants. Seeds were placed under pyramids of different sizes and colors which all were scale models of the great pyramids in Egypt. However, no differences that could be attributed to the pyramids were noticed between these plants and those of a control group that had no pyramid over them.

One of the semi-hacks of the Honeywell has put together a full adder out of Life (, Conway's game of). This enormous contraption, filling an area approximately 220 cells by 260 cells, has a population of 1713 cells. The adder takes two binary numbers, encoded as glider streams (gliders are little 5-bit patterns that travel diagonally across a field), and adds them serially, producing the sum as another stream. The device consists mainly of glider guns to produce streams of gliders, glider reflectors to make them go around corners, and eaters to eat unwanted gliders. Streams of gliders are positioned so that gliders from different streams collide to produce various Life objects that are the targets of other gliders.

The adder now works (as far as I know). The next task will be to design a Turing machine in Life. This is still quite a way in the future as some basic devices needed by the machine (such as a mechanism to move the tape) have not yet been designed.

If the Math Faculty is still worried about all those pigeons who live around the math building, perhaps they could resort to the tactic that has been discussed in a French resort that has a similar situation. Their idea was to put out grain for the birds laced with hormones... those found in birth control pills. They figured that after a few months, the bird population would be at least cut in half. (Of course there is always the problem that some of the birds might not eat any grain on one of the days of their cycle thus allowing themselves to be gotten into trouble (as it were) and making the drugged feed a wasted effort).

There's also the story about the woman in California who drove around with a dummy in her car. To encourage car pools, some freeways have had lanes designated for use only by cars with two or more people. To qualify herself for those lanes, this woman got an inflatable dummy and placed it in the passenger seat of the car. This was all well and fine until one day a policeman stopped her (I forget what the reason was). He noticed her passenger seemed a little odd, and on closer examination discovered that it was only a dummy. She was given a fine (the dummy didn't qualify as a passenger for a car pool).

Now is the time for us to present this week's INTEGER\_OF\_THE\_WEEK, so here it is:

4

4 is interesting in that it is the result of the formula  $2 \circ 2$  where " $\circ$ " can represent the operations addition, multiplication, exponentiation or any other operation in this series of operators ( $a \circ_{n+1} b = a \circ_n a \circ_n a \dots \circ_n a$ , where  $a$  occurs  $b$  times). I once wondered if the operation that would appear before addition in this series existed, i.e., is there an operation, say  $\circ$ , such that, using  $b$ 's,  $a \circ a \circ a \dots \circ a = a + b$ ? Investigation tends to support the nonexistence of this operation.

4 is the smallest positive composite integer. It is a perfect square (a figure with four sides) and a perfect tetrahedron (a figure with four faces).

Pick any number, and then form a sequence, generating the terms as follows: Take the number and spell it out. The next term of the sequence is the number of letters in the name. (e.g., 26 is "twenty-six". "twenty-six" has 9 letters, therefore the next term of the sequence is 9). Any number at all that you choose will generate a sequence that converges to 4.

In ancient times, it was believed that everything was made up of some combination of four basic elements, earth, air, water and fire.

## THE ANSWER BURLOAF

Last week, Glen Stirling asked the Trob why the mailbox says "MATHNEWS" and not "mathNEWS" on it, like it should. Apparently, around the time that the mailbox was made, the University had run out of ASCII paint. This unfortunately coincided with a strike at the only plant in the area that produces EBCDIC paint, so there was none of that either. This left us with only BCD paint, which can only be used to paint upper case letters.

Dear Answer Burloaf:

Do you know of any good uses of the Fibonacci sequence? It looks neat, but seems rather useless.

Dwight Schic

Dear Dwight:

The Fibonacci sequence (1, 1, 2, 3, 5, 8, ...) seems not to have much practical value. However, it does have other uses. For example, I think it makes a fine way to code stuff. For instance, if you want a pseudonym, you might try this: Let each letter of your name (or userid, even) be represented by a number ( $a=1, b=2, \dots$ ) and then add corresponding letters to terms of the sequence. Turning numbers back to letters, you get your new name. Usually the stuff you get looks like so much gibberish, but if you wiggle it around, you're bound to come up with a reasonable sounding name.

Dear Answer Burloaf:

I know what a Burloaf is. Please tell me why you called yourself Burloaf.

H. D.

Dear H. D.:

There is an ancient religion (recently found records suggest its existence as far back as 1970) vigorously practiced by several people today, some of whom masquerade as hacks. Seances that last long into the night are performed by people sitting a table laid out in little squares. These people, under the light of a single 40-watt bulb, perform strange rites of automation. There are several holy orders of Life objects in this religion, of which only a very few select Life patterns that feature certain outstanding salient properties can be members. The most noble pattern of one of the more honourable orders is the Burloaf. At one of the regular meetings of the Lifers, the name Burloaf was conferred upon me to help celebrate my inaguration as a full member of the Life religion. (I had just completed the entry requirements of filling an entire pad of automata [graph] paper with little circles.) Why the Burloaf of all patterns was chosen, I am not allowed to tell you.

...continued on page 5

Dear Answer Burloaf:

I have often read about some people (I use the term loosely) who are called "hacks". They apparently live in terminal rooms, forever staring into terminals and devising ways to crash the computer to which the terminal is connected. However, just last week, I saw a big photo feature which showed a team of broom-ball players called the "Math Hacks". I thought Hacks had a reputation for not even allowing the thought of physical activity to cross their minds. Yet in the pictures, they are actually running and wielding brooms. What gives here?

Morris S. Farnsworth

Dear Morris:

The first set of hacks you mentioned are the Honeywell Hacks (maybe I should say UNIX, the way things are going) and are in no way to be confused with the second set of people that are the "Math Hacks". I have a sneaking suspicion that the Math Hacks stole their name from the first group, but I can't be positive. As far as computer Hacks go, I have been told that UW is distinguished in being one of very few institutions that has a sizeable team of Hacks. The people upstairs no doubt regard this as a mixed blessing.

Anyway, the two groups do have features in common. They are constantly applying their hack don't-know-how to bungle their way along and foul up things to a far greater amount than could be possibly hoped for for a normal person. Hacks are people dedicated to what they are truly interested in. They also tend to be somewhat independent and do as they please. They perpetually ignore people who tell them where they can go. Summing up, a hack is someone who is solving today's problems tomorrow.

Dear Answer Burloaf:

Is it possible to square the circle? I heard the ancients tried to, but never succeeded.

Abel Pascal

Dear Abel:

Squaring the circle is actually quite easy. Here it is done for you:  $\bigcirc^2$ .

## Mathsoc Fee Increase No Verdict

With a response to mathNEWS's survey of 7 people out of 2000, it seems Mathies really don't care whether their Society fees are raised. With an inconclusive vote of 3 for \$2.50, 2 for \$3.00, and 2 for \$3.50, it seems that Math Society can ignore these results, and vote for almost any fee it wants. Though comments were asked for in the the past few weeks, none were given.

# Generalized Logic: An Introduction

In the last hundred years or so, mathematics has undergone a tremendous growth in size and complexity and subtlety. This growth has given rise to a demand for more flexible methods of proving theorems than the laborious, difficult, pedantic, "rigorous" methods previously in favor. This demand has been met by what is now a well-developed branch of mathematics known as Generalized Logic. I don't want to develop the theory of Generalized Logic in detail, but I must introduce some necessary terms. In Classical Logic, a Theorem consists of a True Statement for which there exists a Classical Proof. In Generalized Logic, we relax both of these restrictions: a Generalized Theorem consists of a Statement for which there exists a Generalized Proof. I think that the meaning of these terms should be sufficiently clear without the need for elaborate definitions.

The applications of Generalized Proofs will be obvious. Professional authors of text-books use them freely, especially when proving mathematical results in Physics texts. Teachers and lecturers find that the use of Generalized Proofs enables them to make complex ideas readily accessible to students at an elementary level (without the necessity for the tutor to understand them himself). Research workers in a hurry to claim priority for a new result, or who lack the time and inclination to be pedantic, find Generalized Proofs useful in writing papers. In this application, Generalized Proofs have the further advantage that the result is not required to be true, thus eliminating a tiresome (and now superfluous) restriction on the growth of mathematics.

I want now to consider some of the proof techniques which Generalized Logic has made available. I will be concerned mostly with the ways in which these methods can be applied in lecture courses; they require only trivial modifications to be used in text-books and research papers.

The *reductio* methods are particularly worthy of note. There are, as everyone knows, two *reductio* methods available: *reductio ad nauseam* and *reductio ad erratum*. Both methods begin in the same way: the mathematician denies the result he is trying to prove, and writes down all the consequences of this denial that he can think of. The methods are most effective if these consequences are written down at random, preferably in odd vacant corners of the blackboard.

Although the methods begin in the same way, their aims are completely different. In *reductio ad nauseam* the lecturer's aim is to get everyone in the class asleep and not taking notes. (The latter is a much stronger condition.) The lecturer then has only to clean the blackboard and announce, "Thus we arrive at a contradiction, and the result is established". There

is no need to shout this: it is the signal for which everyone's subconscious has been waiting. The entire class will awaken, stretch, and decide to get the last part of the proof from someone else. If everyone had stopped taking notes, therefore, there is no "someone else", and the result is established.

In *reductio ad erratum* the aim is more subtle. If the working is complicated and pointless enough, an error is bound to occur. The first few such mistakes may well be picked up by an attentive class, but sooner or later one will get through. For a while, this error will lie dormant, buried deep in the working, but eventually it will come to the surface and announce its presence by contradicting something which has gone before. The theorem is then proved.

It should be noted that in *reductio ad erratum* the lecturer need not be aware of this random error or of the use he has made of it. The best practitioners of this method can produce deep and subtle errors within two or three lines and surface them within minutes, all by an instinctive process of which they are never aware. The subconscious artistry displayed by a really virtuoso master to a connoisseur who knows what to look for can be breathtaking.

There is a whole class of methods which can be applied when a lecturer can get from his premisses  $P$  to a statement  $A$ , and from another statement  $B$  to the desired conclusion  $C$ , but he cannot bridge the gap from  $A$  to  $B$ . A number of techniques are available to the aggressive lecturer in this emergency. He can write down  $A$ , and without any hesitation put "therefore  $B$ ". If the theorem is dull enough, it is unlikely that anyone will question the "therefore". This is the method of Proof by Omission, and is remarkably easy to get away with (sorry, "remarkably easy to apply with success").

Alternatively, there is the Proof by Misdirection, where some statement that looks rather like " $A$ , therefore  $B$ " is proved. A good bet is to prove the converse " $B$ , therefore  $A$ ": this will always satisfy a first-year class. The Proof by Misdirection has a countably infinite analog, if the lecturer is not pressed for time, in the method of Proof by Convergent Irrelevancies.

Proof by Definition is sometimes used: the lecturer defines a set  $S$  of whatever entities he is considering for which  $B$  is true, and announces that in future he will be concerned only with members of  $S$ . Even an Honours class will probably take this at face value, without enquiring whether the set  $S$  might not be empty.

Proof by Assertion is unanswerable. If some vague waffle about why  $B$  is true does not satisfy the class, the lecturer simply says, "This point should be intuitively obvious. I've explained it as clearly as I can."

continued from page 5... If you still cannot see it, you will just have to think very carefully about it yourselves, and then you will see how trivial and obvious it is."

The hallmark of a **Proof by Admission of Ignorance** is the statement, "None of the text-books makes this point clear. The result is certainly true, but I don't know why. We shall just have to accept it as it stands." This otherwise satisfactory method has the potential disadvantage that somebody in the class may know why the result is true (or worse, why it is false) and be prepared to say so.

A **Proof by Non-Existent Reference** will silence all but the most determined troublemaker. "You will find a proof of this given in Copson on page 445", which is in the middle of the index. An important variant of this technique can be used by lecturers in pairs. Dr. Jones assumes a result which Professor Smith will be proving later in the year; but Professor Smith, finding himself short of time, omits that theorem, since the class has already done it with Dr. Jones...

**Proof by Physical Reasoning** provides uniqueness theorems for many difficult systems of differential equations, but it has other important applications besides. The cosine formula for a triangle, for example, can be obtained by considering the equilibrium of a mechanical system. (Physicists then reverse the procedure, obtaining the conditions for equilibrium of the system from the cosine rule rather than from experiment.)

The ultimate and irrefutable standby, of course, is the self-explanatory technique of **Proof by Assignment**. In a text-book, this can be recognized by the typical expressions "It can readily be shown that..." or "We leave as a trivial exercise for the reader the proof that...". (The words "readily" and "trivial" are an essential part of the technique.)

An obvious and fruitful ploy when confronted with the difficult problem of showing that *B* follows from *A* is the **Delayed Lemma**. "We assert as a lemma, the proof of which we postpone...". This is by no means idle procrastination: there are two possible denouements. In the first place, the lemma may actually be proved later on, using the original theorem in the argument. This **Proof by Circular Cross-Reference** has an obvious inductive generalization to chains of three or more theorems, and some very elegant results arise when this chain of interdependent theorems becomes infinite.

The other possible fate of a Delayed Lemma is the **Proof by Infinite Neglect**, in which the lecture course terminates before the theorem has been proved. The lemma, and the theorem of which it is a part, will naturally be assumed without comment in future courses.

A very subtle method of proving a theorem is the method of **Proof by Osmosis**. Here the theorem is never stated, and no hint of its proof is given, but by the end of the course it is tacitly assumed to be known. The theorem floats about in the air during the entire course and the mechanism by which the class absorbs it is the well-known biological phenomenon of osmosis.

A method of proof which is regrettably little used in undergraduate mathematics is the **Proof by Esthetics** ("This result is too beautiful to be false"). Physicists will be aware that Dirac uses this method to establish the validity of several of his theories, the evidence for which is otherwise fairly slender. His remark "It is more important to have beauty in one's equations than to have them fit experiment"\* has achieved a certain fame.

I want to discuss finally the **Proof by Oral Tradition**. This method gives rise to the celebrated *Folk Theorems*, of which Fermat's Last Theorem is an imperfect example. The classical type exists only as a footnote in a text-book, to the effect that it can be proved (see unpublished lecture notes of the late Professor Green) that... Reference to the late Professor Green's lecture notes reveals that he had never actually seen the proof, but had been assured of its validity in a personal communication, since destroyed, from the great Sir Ernest White. If one could still track it back from here, one would find that Sir Ernest heard of it over coffee one morning from one of his research students, who had seen a proof of the result, in Swedish, in the first issue of a mathematical magazine which never produced a second issue and is not available in the libraries. And so on. Not very surprisingly, it is common for the contents of a Folk Theorem to change dramatically as its history is investigated.

I have made no mention of **Special Methods** such as division by zero, taking wrong square roots, manipulating divergent series, and so forth. These methods, while very powerful, are adequately described in the standard literature. Nor have I discussed the little-known **Fundamental Theorem of All Mathematics**, which states that every number is zero (and whose proof will give the interested reader many hours of enjoyment, and excellent practice in the methods outlined above). However, it will have become apparent what riches there are in the study of Generalized Logic, and I appeal to the Faculty to institute formal courses in this discipline. This should be done preferably at undergraduate level, so that those who go teaching with only a Bachelor's degree should be familiar with the subject. It is certain that in the future nobody will be able to claim a mathematical education without a firm grounding in at least the practical applications of Generalized Logic.

\*P. A. M. Dirac, "The Evolution of the Physicist's Picture of Nature", *Scientific American*, May 1963, p. 47.

#### Introduction to Experimental Control

This course will describe the operation of the Experimental Control Facility. Topics will include: data acquisition, utilities, PDP 11 to VM interface, user programs, tapes, and plotting.

The course will be taught March 2 at 3:30 to 4:30 p.m. by Ken Osborne.

## Metric Radio

Before we begin, a correction to last week's article. The second was defined in terms of the day—but, since 1960, it has been defined as 9.192631770E9 periods of transition radiation between the hyperfine levels of the Cesium-133 atom. I just counted 9.191835214E9—I guess my watch is fast.

Now to the business at hand. The present SI unit for frequency is the hertz, one cycle per second. Since we have eliminated the second, this definition is meaningless, so a new unit must be defined. This unit, which will replace the hertz, will be called the "avis", and will have the natural definition of one cycle per third. Since "A" stands for ampere, avis will be abbreviated "av".

As the title of this article indicates, one immediate consequence of this redefinition will be the re-numbering of radio frequencies. Using the exact conversion (1 Hz = .864 av) followed by suitable rounding (this will lead to slight re-adjustment of actual frequencies), the AM band will run from 620 to 1850 kiloavis (kav); the FM band will run from 100 to 125 megaavis (Mav).

In keeping with the metric spirit, we will give ten examples of revised frequencies for each of the AM and FM bands.

AM (frequencies in kav)

WGR 640	CKEY 680	CFTR 790
CBL 860	CHML 1040	CFRB 1170
CHUM 1220	CKKW 1260	CKFH 1660
	CHYM 1720	

FM (frequencies in Mav)

CJRT 105.4	CKPC 106.6	WBUF 107.5
CBL 108.9	CHFI 113.5	CKFM 115.6
WBEN 118.6	CHUM 120.9	CFCA 121.9
	CKLA 122.8	

For homework, you can calculate the frequencies of light in the visible spectrum. Mail all solutions to ocleibman, and I will personally grade them.

Next week—metric music.

## Computing Centre Courses

### Use of Tapes through BATCH

This seminar provides a basic understanding of the use of tapes to store data through BATCH. Topics covered include: JCL required to use tapes in BATCH, format of unlabeled tapes, format of labeled tapes, security provided by labeled tapes, choosing a blocksize in writing tapes, useful programs for handling tapes, and the rental, purchase, and storage of tapes.

**Prerequisite:** A basic knowledge of JCL will be assumed.

The course will be taught March 2, 2:30 to 3:30 p.m. by Malcolm Robinson.

myth



# LETICS

Scrooge writes about Broomball

This evening, I am departing from the usual format of this column in order to present an item of importance and interest to everyone. Therefore, Mythletics will be drastically abbreviated this time around. My apologies to die-hard sport fans, but this is my column and I can do anything I want in it. However, just so I don't get lynched by my own team-mates who have already sent in their donations to the slush-fund for underprivileged Mythnews reporters, I present the following brief synopsis of last Tuesday's broomball game.

It would appear that Renison broomball teams are easy marks as the Math Hacks easily downed the second squad that college has sent against them in two weeks. Math's fabled *loose connection* line picked up four of the five goals that the Hacks managed to fluke into the net, and grabbed off nine of the night's ten points. *Scrooge* led the scoring with 2 goals and 2 assists, while line-mates *John Ellis* and *Bob Reilly* connected for 2 goals and 2 assists respectively. Somewhere in there I think *Irene* picked up an assist, but since *Dryden* didn't bother to write it down, I'm not really sure. The Hacks' other line only bothered to score once, with *Dave Holland* connecting on a reasonably good set-up from *John Barber*.

Special honourable mention for the week goes to Canada's sweetheart, the one and only *Kathy-X* who, for the first time all year, actually hit the ball forward two out of three tries! Nice going honey!!!

Well, so much for all that. Now comes the message of special interest. The following letter is also being sent to the *Chevron* in the hopes that they will see fit to print it. It is probably the last serious thing that you will see printed here, so savor the sensation!

## Announcing the A.B.A.!

To the Editor of the *Chevron*:

Of late, we have noticed what is (to us, at least), an undesirable trend in the Feedback section of the *Chevron*. As may be seen in previous issues, Feedback is dominated by long haranguing letters, usually denouncing someone or some group as agents of world imperialism. Indeed, it would be a good bet that there are one or more such tirades included this week.

It is our opinion that there are two types of people in this world—those who dominate and who are dominated. Trite as this may seem, the fact is, unfortunately, inescapable. We believe that the authors of those long missives to which we referred earlier, are representatives of several groups bent on world domination.

One of the most vocal and visible at UW are the A.I.A., and we wish to direct ourselves against them. Don't misunderstand us. We do not argue with their desire to rule. We just believe that, with one exception, the world would remain the same if the Anti-Imperialist Alliance managed to oust the decadent capitalists. We feel that inequities are inherent in both systems. However, the exception to which we have alluded is a large one, and its ramifications are serious.

You may not have noticed, but the A.I.A. are very boring! They are just not fun people at all. If we prove unable to dominate our environment, we would at least like to be dominated, with some sense of humor and a little life to them. Decadence sits better with us than boredom, and the A.I.A. are insidious carriers of the latter disease.

In an attempt to stem the (unhappily) rising A.I.A. tide, we are forming an organization to oppose them specifically, and groups like them in general. At first we thought of calling ourselves simply the I.A., but further cogitation on the matter led us to believe that we are not so much in favour of imperialism, as against the A.I.A.

So saying, we have chosen to name ourselves *the Anti-Boredom Alliance!* For too long have we sat back and listened to the uninspired prattle of those aspiring to the leadership of the world boredom movement! We have grown tired of hearing, again and again, *All hail the glorious revolutionary fighting spirit of the peoples' workers' collectives in their struggle against the war-mongering imperialist running-dog lackeys who ... blah-blah-blah*—you get the picture. Trying to read an A.I.A. letter in Feedback is an exercise in futility. You either give up in disgust or fall asleep halfway through.

It is the aim of our organization to battle the rhetoric of the A.I.A. and to show it for what it really is: tired, worn-out, dull, clichés. We intend, much as time and circumstance permit (and as long as we don't become boring), to counter each A.I.A. letter with one of our own in an attempt to even out the boredom/excitement balance which has for too long been uneven in Feedback. We urge all those of like mind to do the same. Revolt now against the cliché-mongers and for once we may truly cry—*Viva la Revolucion!*

Anti-Boredom Alliance.

To register, see Dianne Hart, MC 2008; for more information, see Clive Knowles, MC 2002.

## JJBT (CN) Towers over Opposition

Faster than the Canadian Postal Service; more powerful than a Turing machine; able to leap buried cables at a single bound! Yes, these are just some of the many rigorous qualities which must be met by all JJBT members, and these qualities were necessary as JJBT faced not one, but two opponents last Tuesday—a test of endurance certain to put pressure on their winning(?) ways. First to test JJBT was the "Sweat Hogs". Absolute carnage ensued as JJBT just annihilated them en route to their most convincing victory of the year (JJBT actually scored more points than the opposition). Down slightly in one of the early games, the team was inspired by the brief appearance of psittacosis-stricken Catfish, who came off his sick-bench just long enough to serve three CN Tower specials to gain the victory. The team never looked back, as they crushed Sweat Hogs in all remaining games, buoyed by the hot serving of Debbie and "Wettlaufer."

The effort expended by JJBT in this match unfortunately left them vulnerable against the fresh team from St. Jerome's, who took the first game. Insertion of Graham into the lineup proved to be all that was needed, however, as he led the team with some fine shot-making to victory in game#2. Exceptional spiking by Petec, and the shot of the season by Sylvia into the grandstands (which set up a beautiful spike by Ron when it came down) gave JJBT an easy victory in the rubber match.

In non-UW news, JJBT is pleased to announce that it has awarded an honorary membership to Jean-Pierre Coopman for the manner in which he exemplified their motto, *Concordia cum Perdiendo*, in his fight with Muhammed Ali.

Finally, for those of you who have been wondering who were the exceptional athletes who were named as an "unidentified student team" in the photo section of last week's MaThNeWs [sic]—it was, of course, JJBT, slide rule division.

continued from page 6...

### Introduction to CMS

CMS (Conversational Monitor System) is an interactive terminal system under VM on the 370/158. It provides file manipulation, editing, and execution facilities for most Computing Centre processors and applications, and is the only system on which the PL/I optimizer and SPEAKEASY are available.

The course will be taught March 1 and 3 (two parts) at 3:30 to 4:30 p.m., by Martin Wiseman.

# unclassifiable ADS

## FEEDBACK

mathNEWS will print your ads free of charge. Just jot them down on a piece of paper and put it in our mailbox on the third floor across from the C&D lounge, or take it to Mathsoc and have them put it in our mail slot, or put it in the mail addressed to mathNEWS, MC 3038, or send them in the mail subsystem on TSS to userid mathNEWS.

**Mark Algar:** Your examination report has been in MC 3038 for some time and can be retrieved from the mathNEWS mail slot by showing your ID card—didn't you get the mail message we sent you?

**Ottawa:** Furnished large 2-bedroom apartment to sublet May 1 to August 31. Bronson and the Queen's Way. Close to all services. Girls preferred. Rent: \$230 per month. Write: Janet Selman, 1203-311 Bell Street South, Ottawa, Ontario K1S 4K1 or phone: 1-613-235-5381 evenings after March 1.

**To Sublet:** May to August 1976. A 2-bedroom large apartment. Very close to both universities. \$150/month. Phone: 884-0985.

**To Sublet:** For spring term, (May to August, 1976). A 2-bedroom apartment., 5 minutes from either university. Close to bus stop. For only \$235/month, you get stove, fridge, free underground parking, and much more. Call 885-2522 after 6, Monday-Thursday.

**Wanted:** one English-Flemish interpreter for JJBT. See JJBT article.

**For Sale:** Holiday stereo amplifier. 22 W RMS per channel into 8  $\Omega$  load. More specs upon request. Asking \$100 but will accept offers. Phone 885-3072, ask for Brian.

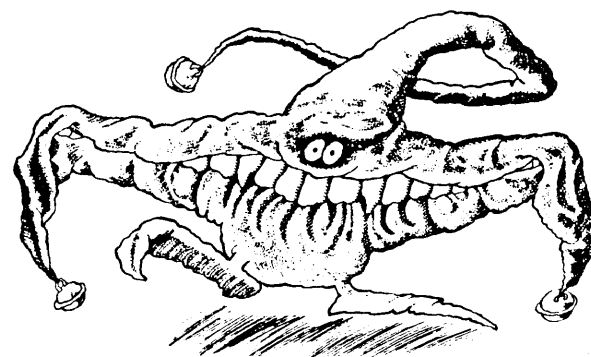
**Beat the Tax and the Postman:** The Mathsoc office (MC 3038) has copies of form T1-M (moving expenses) and change-of-address forms ...and a complete set of Canadian postal code directories.

**Stereo Tapes:** I am attempting to assemble a group of people to purchase stereo recording tape from the U.S. If we order 20+ tapes, the savings will be up to 50% of Canadian prices. If you are interested in reel-to-reel, cassette, or 8-track tape, please contact me at MC 3046 or Honeywell userid rlzoltok. All orders will be cash in advance to avoid this writer getting stung.

I am looking for a girl to share an apartment with, in Toronto, starting May 1. Call evenings 744-4036, ask for Maureen.

**Summer Sublet in Toronto:** Large 2-bedroom apartment, downtown, Wellesley at Parliament. Cable, complete kitchen, sauna, pool, etc. Suitable for 2 to 4 students. Call Toronto 416-925-4989.

**Need a Summer Apartment?** Will sublet furnished two-bedroom apartment for \$180 per month including utilities (price negotiable). Five minutes' walk from campus. Tennis courts and park. 137 University Avenue W., Apt. 1009; Telephone 884-9163, ask for Lloyd, Dave, or Bill.



### Mthel 206A Reply

Dear mathNEWS:

In response to H.A.'s "Mthel 206A inquiry":

If you are eager to pick up a bird credit, by all means attempt to enroll in Mthel 206A. However, your letter seems to indicate that you are interested in teaching. If this is the case, forget Mthel 206A. And don't worry about material in Mthel 206A overlapping with that at teachers' college—it won't, unless teachers' college is even more useless than we've heard.

Twenty ex-Mthel 206A students, teaching option.

(The other 11 unavailable for comment.)

Also: It is a very small class, with 3 profs. Therefore the chances of attending the "story hour" unnoticed and unregistered are very slim.

mathNEWS is the only weekly paper on campus with an all-volunteer staff (Why don't you come out and volunteer sometime? Production meetings are Tuesday nights - Wednesday morns. beginning at 7 pm in MC 3011). It's financed by Mathsoc but the content is the opinions of (or facts known to) the contributors only... The master copies are edited on TSS and phototypeset on the Photon Econosetter, which is not owned by MFCF but rather by a group of faculty members... then we send them to Graphic Services. who make 1200 copies... last week it was 1300, though. Now, this issue was put together by RAG cut up WHITE, SCROOGE, G G DRYDEN, MIKE (right?) DILLON, PETER afhr RAYNHAM, J J not too LONG this time, RANDY 6 MORPISON, a couple of iibt'ers named OWEN LEIBMAN (I LIED the other weke) and RON S STEINER, and the editorial staff RANDALL S McDUGALL and me MARK S BRADER. Other people who should have signed the list or at least wrote articles were JOE LIFSHITZ of C&D, EQTROB of WIDJET, and W M GENTLEMAN of MFCF... that takes care of the live ones... (Mike Wallis (NOT Wallace) asks me to plug Westworld at 7 and 9 pm on Monday March 1 in MC 2066, despite what was said on page 4) Now to Photon adventures... at about 11 pm WMG dropped into 3011 and wondered why he couldn't make the thing work... we decided it needed rebooting... so rag gave it a few boots... about 11:50 we realized we were not using the proper boot tape and had to call RJB (enter, bow, exit) to find out where the real one was... on the third try at 12:40 we made it work... after that all it did was mangle a small piece of film inside the chamber, causing the beginnings and ends of some lines to mysteriously vanish...it took about 1 hour and 11 feet (of which 3 feet were blank) of film to set up this issue, excluding the Generalized Logic article which we've had on file since issue 90 ... that fills the page, so CONTROL D ('4)