

COMPUTERS

Selling Free Software

Maverick programmer opts for mega-use over megabucks with adaptable code

By **Simson L. Garfinkel**

Special to The Christian Science Monitor

CAMBRIDGE, MASS.

BY many accounts, he is one of the best programmers in the United States.

His going rate for consulting is \$200 an hour. But these days, Richard M. Stallman spends all the time he can in a crowded, 130-square-foot office in Cambridge, Mass., writing "free" software.

To Mr. Stallman, "free software is a matter of freedom, not price." Copies of his programs sell for \$150, but a person who buys one is free to do almost anything with it, including making duplicates to give away or sell. This stands in stark contrast to the rest of the software industry, where restrictive software licenses are the norm.

Most programs today are purchased "object-code only" — in a form that can be used by computers, but is virtually useless to humans who would like to take the programs apart, see how they work, and possibly make improvements. Software companies keep their "source-code" — the actual text their programmers write — closely guarded secrets, or sell it for tens of thousands of dollars.

Nobody appreciates how useful source-code can be more than computer programmer Stallman.

In the late 1970s, when he was a staff member of the Massachusetts Institute of Technology's Artificial Intelligence Laboratory, he and other programmers took the source-code for the lab's central graphics printer and added a slew of new features.

"Whenever there was a paper jam, it would send a message to everybody who had a job waiting," Stallman recalls. "When it finished [printing], it would notify you."

But when the lab upgraded its printer, the new machine was supplied with a driving program that was object-code only.

"We wanted to put those features into the [new] program, but we couldn't, and Xerox wouldn't," Stallman says. "We didn't have the source-code, so we had to suffer

with paper jams that nobody knew about."

To add insult to injury, Stallman ran across a programmer at Carnegie-Mellon University who had a copy of the source-code, "but he refused to let me have it, because he had signed a nondisclosure agreement," Stallman says.

Such agreements are common in the computer industry. Stallman believes they stifle innovation by forcing programmers to constantly rewrite parts of programs that others have already written, and by preventing people from fixing problems in programs that they use. "Every such agreement is a betrayal of society for personal advantage," he says.

Five years ago Stallman, known to his associates simply by the initials RMS, decided to change things: He started Project GNU, whose herculean task it is to write a version of the popular Unix operating system for which every body would have free and open access to the source-code. (GNU stands for GNU's Not Unix.) Three years later he set up the nonprofit Free Software Foundation, whose five directors, four paid employees, and hundreds of volunteers around the world are helping with the task.

Once the project is finished, he says, people won't have to sign license agreements that make it a crime to share programs with their friends.

The first GNU program, a text editor called Emacs, was made available in the spring of 1985. Since then it has become a de facto standard editor for high-performance computers worldwide, and is now included as standard equipment by a number of manufacturers.

In many ways, Stallman's Emacs embodies his ideals of what software should be: Emacs is powerful,

yet easily modified by programmers who wish to customize it to their own tastes.

Stallman stresses that his software is not "public domain." Every line of the program is covered by a software license that has one non-negotiable rule: No one may incorporate it into a proprietary computer program or distribute it without making the source-code available.

Today, GNU Emacs is used by

many people are willing to pay for copies of them, which so far has been the foundation's primary source of revenues. Last year, the foundation grossed \$200,000, compared with only \$23,000 just two years before. Nearly all the money collected goes to hire programmers who are writing the rest of GNU.

The foundation has also increasingly been the target of corporate gifts of money, equipment, and people.

Work stations on loan from computer companies litter the main work area, part of a hallway borrowed from MIT's Artificial Intelligence Lab.

Hewlett-Packard, a major computer manufacturer, has promised the project \$1,000,000 in money and \$350,000 in equipment.

But that grant was held up for more than three months, Stallman says, because HP wanted him to sign a software license agreement promising that the programs supplied with the computers would not be copied.

"I don't think that people should ever make promises not to share with their neighbor, and I've decided to live by that myself," Stallman says.

Like the hundreds of people who have volunteered to work on GNU, Stallman has donated all his work.

He supports himself by writing programs on a free-licence basis two months each year; and he refuses to work on any project that produces proprietary programs. So far, he hasn't had any problems finding jobs.

NOT everyone is enamored of the Free Software Foundation. One company, Unipress Software, sells a program for \$395 a copy that is in many ways similar to Stallman's Emacs.

"Implicitly, there have to be problems" with free software, says Unipress's vice-president, Frederick Pack, "at least with support."

But many people feel that GNU programs are actually supported better than many programs sold on the market.

"There are bugs in vendor-supplied compilers that go on unfixed for years," says Utah's Mr. Sealey. "In the case of GCC, we often fix the bugs ourselves, and if we can't, we send mail to RMS and he fixes them for us, usually within a day."

SPLIT-LEVEL COMPUTER CODES

■ A computer program has two faces.

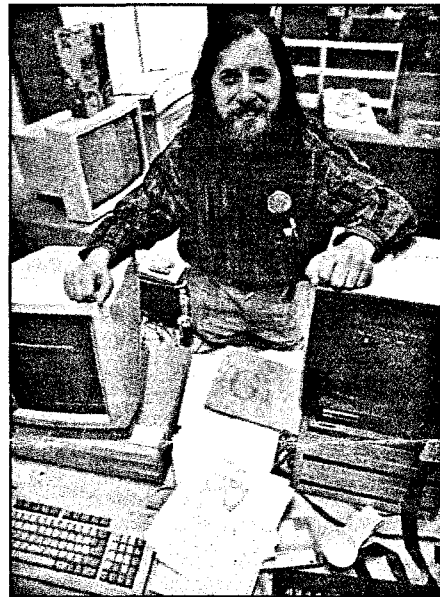
On the screen of the programmer, one face — the "source-code" — looks like a cross between recipes in a cookbook and mathematical proofs, each line containing a set of instructions for the computer to perform at a certain step in the program. Around these steps are comments, which explain how the program works.

Before the program can be run on a computer, however, it must be translated into the language the computer speaks.

The translator program takes the source-code, compacts it, and changes it into "object-code," which can be executed quickly by a computer. This face is nearly impossible for a human to read, let alone decode.

Most computer programs are sold in object-code form today; software companies generally keep their source-code a carefully guarded secret.

— S. L. G.



RICHARD STALLMAN: 'Free' software is not a matter of price.

JOHN VAN HERT — STAFF

Source-Code

```
#include <stdio.h>
main (argc, argv)
char **argv;
{
  write(1, "Hello world!\n", 13);
}
```

The source-code for a simple program that prints the words "Hello world!"

Compiler

A program called a compiler translates source-code into object-code, which actually runs the computer.

Object-Code

```
.....\..C.Sw.
C.w.uw.C.t.t...2.h...D.Ph#
..8..tU.lWV...2..W?..W2..Wh..
.D.i...ihh...v...8...oi)C.
8..i...f|^]C.U.lV.v..N..^.#
#0...o...S"s.#6.8.P]Ckk
k..Hello world!....
```

A representation of the object-code of the program at left looks something like this.

JOHN VAN HERT — STAFF

hundreds of thousands of people around the world, Stallman estimates.

But there is no way of knowing the actual number, says Len Tower Jr., one of the foundation's directors. "It's a hard question to answer because of the way we do distribution: We encourage people to pass it on."

What has attracted even more attention than the editor is Stallman's compiler, an essential part of any operating system that takes source-code and turns it into object-code. GCC, as the program is called, is considered by many to be one of the best compilers around.

"It produces code that is as good or better than any commercial compiler that I have ever used," says Donn Seeley, a senior systems programmer at the University of Utah.

Next Inc., the company started by Steve Jobs, the founder of Apple Computer, has chosen GCC for the basis of its new system. "The GNU C compiler generates very efficient and well-optimized code," says Robert Fraik, system software product manager of Next Inc.

Despite the fact that the pro-

BOOKS

Lives Fixed in Flux

LOVE LIFE: STORIES

by *Bobbie Ann Mason*
New York: Harper & Row
241 pp., \$17.95

By *Catherine Foster*

IN Bobbie Ann Mason's universe, all is in flux: the Kentucky farms are being replaced by subdivision "farmettes," factories from the North are moving in. Satellite dishes bristle from backyards, bringing a dizzying squawk of loud stations.

It's a universe she brought to our attention in her first book, "Shiloh and Other Stories," in 1983, which won a PEN/Hemingway Award for a first work of fiction. And it's one she continues to explore in her fourth, "Love Life," also a collection of short sto-

ries. In them, she chronicles the lives of people who are trying to keep their footing as the new era swirls in around them. Some are looking to take the next step.

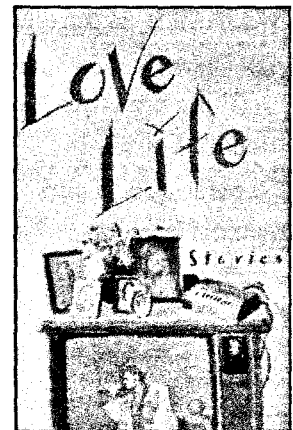
The country cousins of John Updike's and Ann Beattie's well-heeled suburbanites, Mason's characters watch cable TV, have yards strewn with vehicles, and vacation at Disney World. They're inarticulate, yearning people, dissatisfied with their lives and unmoved by change.

"In the last months they lived together," thinks Beverly about her ex-husband in one story, "Memphis," "she had begun to feel that her mind was crammed with useless information, like a landfill, and there wasn't space deep down in her to move around in, to explore what was there. She felt she had strong ideas and meaningful thoughts, but often when she tried to reach for one she couldn't find it."

Mickey, a real estate broker in "Private Lies," wants to find the daughter he and his first wife gave up for adoption 18 years ago. The fragmentation of his thinking is reflected in the writing. "If Mickey had some money, he'd hire a detective. If he sold a house, he would go to Florida to search for his daughter. He would kidnap Donna [his first wife] and take her with him. He couldn't get over her bridgework. It made her smile sexy and mysterious. Nobody was thinking seriously of buying."

As one could guess from the titles, these stories have something to do with love, sometimes between parent and child, or between friends. But most often the love she's exploring is the marital, or premarital, variety. Often it has gone stale. While Mason's men think about making change, too often it's just that; thinking. Her women are the ones

who most often think about doing something different and end up doing it. The exception is Cobb, a 28-year-old soil conservation worker eager to get married, in "Coyotes." He finds a sense of adventure in life through his fiancée, Lynette, who makes him



feel as if "there are different ways to look at the world."

The beauty of the pieces lies in Mason's eye for detail. "The men's shorts on Mrs. Bush's wash line flap in the breeze like flags of surrender." Mason is a loving scribe to a way of life ignored in an upscale world. She precisely renders small moments, and has a knack for capturing quirks.

But there is a sameness to it all; the lassitude, the small dreams and baby steps of freedom ended up affecting this reviewer like a mall where the stores all carry the same goods. One wishes that once in a while these characters, whose wings are flapping, would actually take off.

■ *Catherine Foster is on the Monitor staff.*

Mr. Tower amplifies the point: "GNU or free software is never going to hold you up. If you need a bug fixed, you can hire a competent programmer and have it done."

To make things easier, the Free Software Foundation distributes a list of programmers who are willing to work on GNU software on an hourly basis.

Having access to source-code is also important for security reasons, says Jeffrey I. Schiller, manager of MIT's campus network. Having source-code means that holes in security can be fixed as soon as they are detected, rather than waiting for new releases of software from vendors.

SEVERAL programs remain to be written before GNU is usable as a full-fledged computer operating system.

One is the "kernel," the program at the heart of the operating system that arbitrates between multiple programs, which want to run at the same time.

Another is the "file system," which dictates how the computer arranges information on its disks.

Tower hopes that GNU project will be able to use a kernel and a file system developed independently in the academic computer community.

Like GNU, many universities are now distributing their software on a free basis.

Stallman estimates that the operating system might be functional within two years. "One nice thing about not being a commercial organization is, we don't need to have estimates of completion time," he jokes. "I don't have to say when it will be done. I just have to do my best."

SCIENCE COMMENTARY

Hydrogen Fusion Hype

THE continuing news blitz over tabletop hydrogen fusion is both tantalizing and obscure.

It's tantalizing because, as of this writing, there still is no clear indication of a genuine scientific breakthrough that engineers can develop into a virtually limitless source of energy. This is so, even though hundreds of scientists around the world have been feverishly chasing the chimera loosed at a hastily called press conference March 23 by E. Stanley Pons of the University of Utah and Martin Fleischmann of Southampton (England) University.

The obscenity lies in the penchant for some of these scientists to forsake the normal channels of professional communication and announce half-baked results of slapdash experiments at press conferences. This has kept the story of what might be a major discovery befogged in confusion for over a month. It has also made some of the scientists look silly. Consider, for example, the Georgia Tech team that had to call a second press conference to report a technical flaw that invalidated its previously announced "confirmation" of the Utah experiments.

Pons and Fleischmann set the style for this confusion with their original announcement.

They had been working for half a decade with small battery-powered electrochemical cells filled with heavy water. The electric current breaks up the water molecules into deuterium (double-heavy hydrogen) and oxygen. Palladium electrodes then absorb the deuterium.

The work had reached a point where, the experimenters claim, cells produced three to four times as much energy as it took to operate them. Furthermore, there were signs that deuterium fusion was taking place inside the palladium.

Meanwhile, at nearby Brigham Young University, Steven E. Jones and associates were running differ-

ent but comparable experiments that gave evidence of fusion but produced little energy.

Reportedly, the two teams agreed to submit reports of their work simultaneously to the journal *Nature* March 24.

But then the Utah team unexpectedly called the March 23 press conference, saying a paper would appear in *Nature* later.

Eventually *Nature* did receive the papers, gave them to scientific referees to review, and returned them to their authors for revision. The Brigham Young team answered the referees' questions and *Nature* accepted the paper. Pons and Fleischmann, however, withdrew their submission.

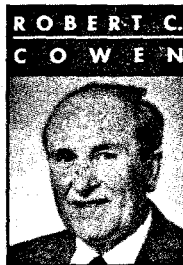
This was a graceless move. Scientists who want to confirm the Utah work have been hampered by not knowing, in detail, exactly what was done.

Indeed, partial reports of that work and of the proliferating experiments elsewhere have been circulating globally via fax transmissions and electronic mail. But crucial details always seem to

be lacking. Experiments that reportedly confirm the Utah results have generally turned out to be inconclusive.

It's time for the scientists involved to cool the "gold fever" the Utah press conference ignited. Whatever wealth and glory may come of tabletop fusion lie far in the future. The important business at hand is to learn exactly what is happening in the jars — it may not even be fusion — and whether it has any bearing on energy supply. This is best done through careful research that is reported through normal means of scientific communication to ensure that the reports are adequately detailed and technically sound.

Meanwhile, the public should take all claims of fusion in a jar with skepticism. When scientists hype their work, not even the experts know who to believe.



Chronicler of Change

THE farm that Bobbie Ann Mason grew up on in Mayfield, Ky., is now surrounded by a subdivision, an industrial park, a railroad, a tobacco warehouse. The people she writes about are living through the tumultuous changes that happen as a new era washes over the old.

"They're my people, the people I come from," she said of her characters, in a recent interview. "I was concerned about their lives. I had witnessed the migration away from the farm and the kinds of things that happen to them."

"I think marriage is the arena where the big changes in our society are being reflected, and basically I'm always writing about change. Often it seems that the conflict in the marriage is between somebody who wants to hang on to the past and someone who wants to stride out into the future. Or somebody who is very committed to the place and someone else who wants to strike out into a new frontier."

"[A] lot has been made about rootlessness, and a lot about roots has been romanticized. As the writer of these characters, I see a lot of excitement in their rootlessness, because they're being uprooted from a lot of things I find bad. It takes courage to deal with freedom . . . to forge ahead."

— C. F.