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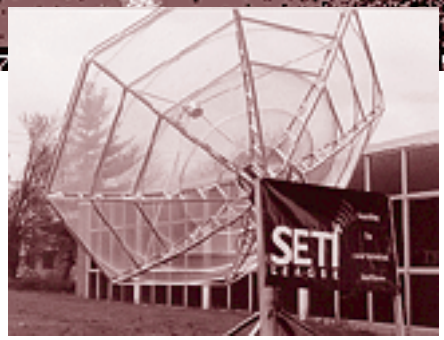
Executive Director, The SETI League, Inc.

# Join in the worldwide, backyard Search for Extra-Terrestrial Intelligence


*The search for some ordered and therefore intelligent signal buried in the background chaos uses equipment that is today available to nearly everyone.*




*Perhaps ET is not phoning home after all. Maybe he's trying to call us ...*

The Search for Extra-Terrestrial Intelligence (SETI), once a multi-million dollar NASA venture, is now in private hands. In 52 countries on six continents, a thousand dedicated experimenters are now using their backyard SETI stations to seek out that elusive needle in the interstellar haystack.

You can't buy a radio telescope at your local Radio Shack store. But now, thanks to a joint effort between the SETI League and Grove Enterprises, you, too, can join the search for our cosmic companions with components or a complete system. Or, if you're reasonably handy with tin-snips, know which end of the soldering iron is the handle, and have a few hundred (to a few thousand) dollars to invest, you can build your own.

## What We're Looking For

Our Earth is surrounded by a telltale sphere of artificial radiation, now extending out to about 50 light years and still traveling outward

***Without a doubt, the 1997 movie "Contact," starring Jodie Foster, rekindled the public's interest in the search for "signals from space."***

at the fastest possible speed: the speed of light. This radio, TV, radar, and microwave pollution is readily detectable to any local civilization which has radio astronomy. We figure that some of the countless beings living in the light of distant suns may also pollute their radio environment, and we stand a reasonable chance of detecting them.

But don't expect to tune in an alien *I Love Lucy*. Interstellar signals will be so weak that our eyes and ears will never recognize them. The most we can hope for is order in the cosmic chaos, patterns which could not have been produced by any natural mechanism which we know and understand. These hallmarks of artificiality are evident to computers, and it is your home computer which will sift through the cosmic static in search of ET (see Figure 1).

Now, where on the dial should we look? It's highly unlikely that ET honors the Federal Communications Commission band plans, so we can only guess as to their likely channel lineup. There may well be many good frequencies for SETI, but what they must have in common is their ability to pass unimpeded through the interstellar medium. Since the space between the stars is most transparent in the microwave spectrum, that's where we'll start our search.

Satellite TV is broadcast in the microwave region. So are radar, cellular telephone, and much of Earth's telecommunications relay signals. There are also navigation signals from the swarm of Global Positioning Satellites (GPS) surrounding our planet. If we're going to seek out weak signals from the stars, we need to search in the gaps between our own transmissions. One such interesting gap (there are others) is the resonant frequency of hydrogen atoms, 1420 MHz, and many amateur and professional SETI stations start out there.

## What You'll Need:

### THE ANTENNA

Although other configurations are sometimes used, the hands-down favorite for snagging alien photons is the parabolic reflector, or dish antenna. A 3 to 5 meter (10 to 16 feet) diameter dish is just about the right size to stand a reasonable chance of SETI success. The classic C-band backyard satellite TV dish is ideal. These have high gain, narrow beamwidth, work over a wide range of frequencies, and are readily available for next to nothing. And if you're a satellite TV fan, chances are you already have one.

Around the country millions of TV viewers are upgrading to Ku-band Direct Broadcast Satellite (DBS) reception. Its half-meter dishes are very appealing. That leaves millions of C-band BUDs (Big Ugly Dishes) sitting around gathering rust. Many SETI enthusiasts

# Tool Chest for Locating ET

have found neighbors anxious to have these eyesores taken off their hands (see Figure 2).

You can use your satellite TV dish to focus 1420 MHz energy, but *not* its C-band feedhorn. Plan on building or buying a larger tin can to capture these longer wavelengths. A commercial feed which will directly replace your TVRO horn (see Figure 3) can be purchased for around $150. If you want to use your BUD to watch TV and do SETI in the background, you can mount your SETI feedhorn next to your TVRO one, and multitask (see Figure 4).

## THE PREAMP

The purpose of a preamplifier is to take an impossibly weak signal from space, and turn it into merely a ridiculously weak one. You used one of these for satellite TV (it may have been called an LNA, LNB, or LNC), but it probably doesn't work on ET's channel. Fortunately, radio astronomy preamps for the desired frequency range (see Figure 5) are readily available from a number of sources. Price varies from about $50 for a kit preamp up to perhaps $200 for a top of the line, assembled and tested one.

The preamp mounts directly to the feedhorn with a coax connector, and drives the coaxial feedline which runs inside to your receiver. You'll also need to run juice from a 12-volt power supply up to your preamp, either through the feedline or on a separate length of lamp cord or speaker wire.

## THE RECEIVER

Once you've amplified your weak alien signal, you'll need to break it down to audio components which your computer can analyze. This is the job of a microwave receiver. The earliest amateur SETI stations employed ham radio's old standard, the venerable Icom model R-7000 wide-coverage receiver, and its successors, the IC R-7100 and the current R-8500 (see Figure 6). The AOR AR5000 Plus and AR7000 are two additional choices.

These highly capable receivers are a good bet, though the nearly-$2000 price tag exceeds the cost of all other parts of your SETI station combined. Fortunately for the frugal signal searcher, some less costly alternatives are emerging.

For years ham radio operators have been converting microwave signals down to frequency regions which their existing shortwave receivers can process, and SETI is no

FIGURE 2

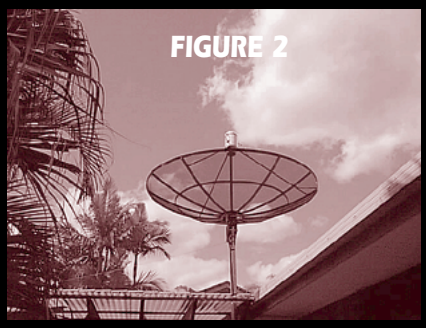
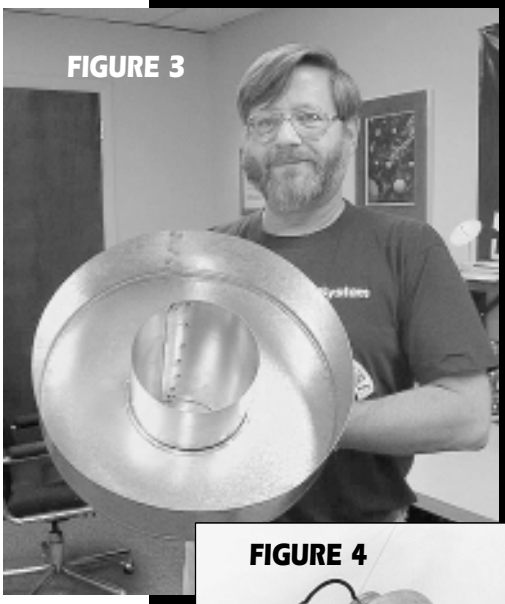


FIGURE 6

FIGURE 3



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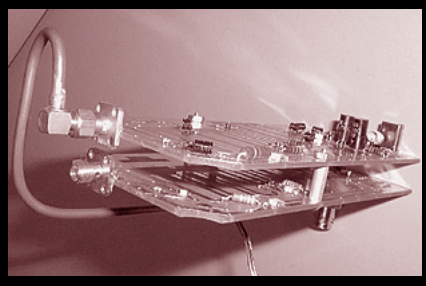

FIGURE 4

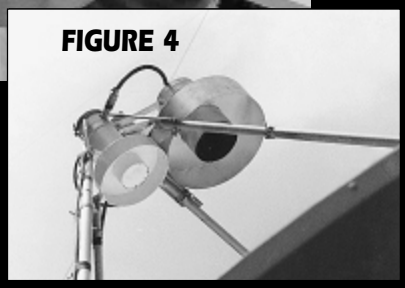

FIGURE 8


FIGURE 5

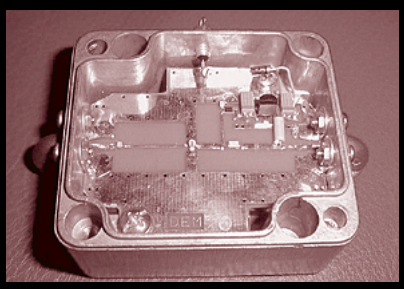

FIGURE 9

exception. For just over a hundred dollars in kit form (twice that if already assembled), you can today buy a downconverter which will shift the most interesting radio astronomy frequency down to the popular two meter band for reception in your existing VHF rig (see Figure 7).

By adding a $100 2-meter SSB receiver kit to that downconverter (see Figure 8), enterprising experimenters have been building their own complete SETI receivers for a small fraction of the cost of commercial units. We hope such packaged special-purpose receivers will come on the market as manufacturers recognize the market potential of SETI.

Lately, receivers-on-a-card are all the rage. For example, Rosetta Labs of Australia makes its WiNRADiO scanning receiver, available both as plug-in cards and external modules (Figure 9) to be hosted by your personal computer. The newest models WR1500 and 3100 are providing improved performance at significantly reduced cost.

## THE COMPUTER

The purpose of the SETI computer is to run the software which recognizes ET amid the cosmic din. A good bit of number-crunching power is required. The technique is called Digital Signal Processing (DSP), and is the one part of the SETI task which has grown in power at an amazing rate. Raw computer horsepower seems to double every year or so,

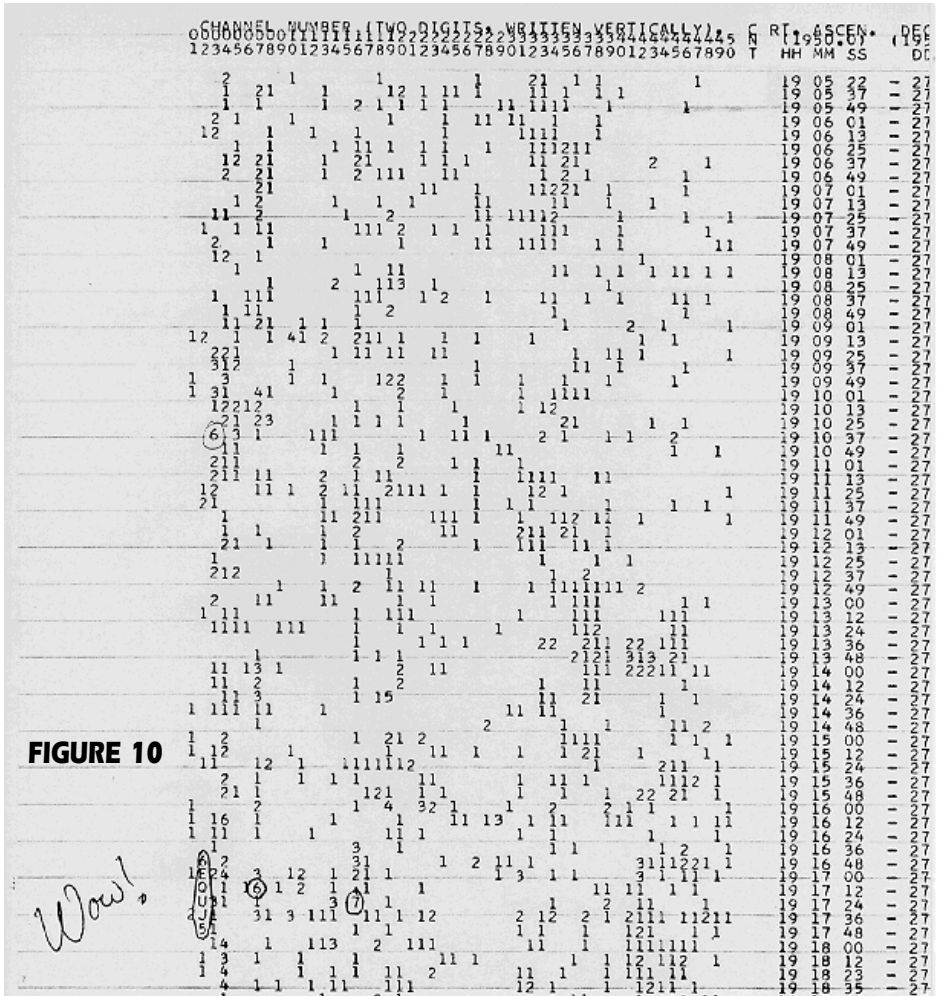


FIGURE 10

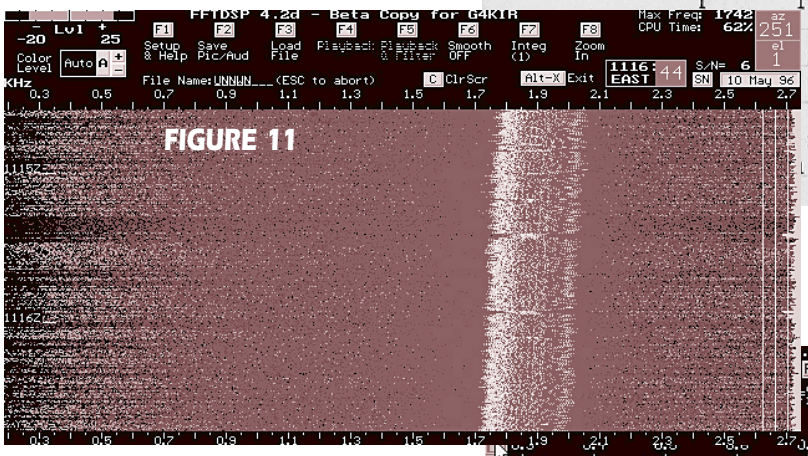


FIGURE 11

which means today's home computers are 1000 times more powerful than those of just ten years ago, and 1,000,000 times more powerful than those of two decades past!

We start by breaking down the receiver's audio into ones and zeroes, using a circuit called an Analog-to-Digital Converter; there's a very capable ADC in your garden-variety $29 sound card, and that's what most of us are using.

DSP software comes in a variety of flavors, with the most popular varieties being shareware for the DOS and Windows envi-

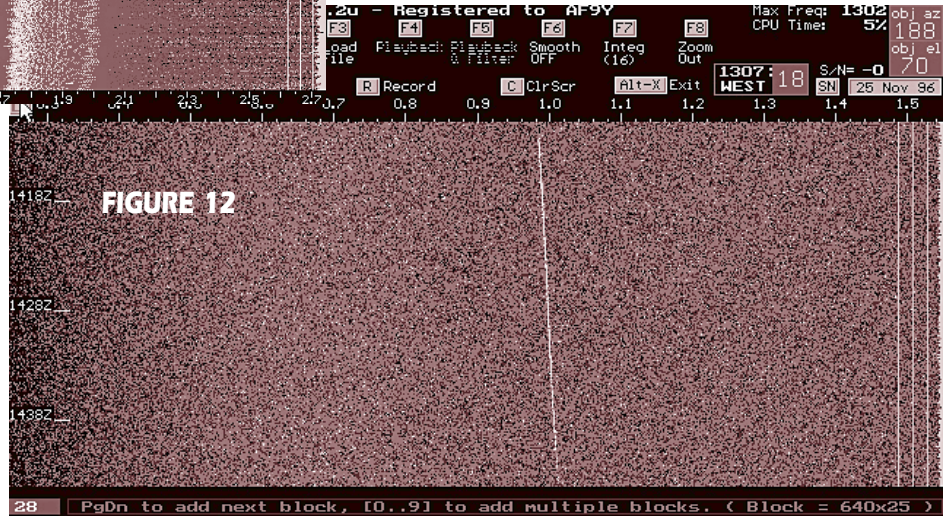


FIGURE 12

ronments. As for the computer on which this software runs, a high-speed Pentium is nice, but not essential. Many a SETI enthusiast has used the old 486, which his or her Pentium recently replaced, as a dedicated signal processing machine. And a few SETIzens have even resurrected their old 386 and 286 machines for DSP use. The rule seems to be, any computer you can get your hands on will be more sensitive than your own eyes and ears in separating the alien wheat from the cosmic chaff!

## Putting It All Together

All the bits and pieces can be a tad intimidating, but you won't be going it alone. The SETI League is the world's leading grassroots SETI organization, with hundreds of members in dozens of countries on six continents, and growing. Our website (**http://www.setileague.org/**), technical manuals, and volunteer regional coordinators have already helped hundreds of individual experimenters to get their stations up and running, and they stand ready to assist you as well.

SETI league members come from all professions, educational levels and walks of life. We share a common curiosity about the beyond, as well as a conviction that we can make a difference.

And Grove Enterprises is making the task easier, too, by offering a special SETI package including your choice of receiver, the feedhorn, low noise amplifier, and even the cabling for your SETI terminal.

## What We've Heard So Far

Organized SETI has been going on for nearly forty years. About once or twice a year, we detect something strange, a signal which we just can't explain away. Unfortunately, none of these tantalizing candidate signals has yet proven conclusive. SETI demands the most stringent level of proof, if it is to answer the fundamental question which has haunted humankind since first we realized that the points of light in the night sky are other suns: *Are We Alone?*

The granddaddy of all SETI candidate signals was detected at the Ohio State University radio telescope in 1977. It is universally known as the "Wow!" signal, after the word scribbled in the margin of the computer printout when investigator Dr. Jerry Ehman first noticed it (see Figure 10). The "Wow!" was even mentioned in an episode of Fox TV's *The X-Files*. After over 100 follow-on studies, the "Wow!" has never repeated. But today's amateur SETI stations are *just as powerful* as the Ohio State facility was twenty-one years ago when the "Wow!" was detected. Thus it is our hope that, when enough private SETIzens are up and running, the next "Wow!" will prove less elusive.

We've already had a few close encounters. The SETI League's *Project Argus* search of the heavens went on the air in April 1996, initially with just five observing stations (our overall plan calls for 5,000). Only three weeks later, two radio amateurs in England detected the anomaly seen in Figure 11. At first glance, this seemed to be just the sort of signal we'd expect from Beyond. It turned out to be a classified military satellite — beyond Earth to be sure, but hardly the ET we were seeking.

Our next interesting signal (see Figure 12) came from the 1.3 watt beacon transmitter aboard the *Mars Global Surveyor* satellite, clearly detectable at several million kilometers from Earth.

Such detections give us ample encouragement that our systems are up to the task of alien detection. Now all we need is enough participants around the world, coordinated through the Internet, so that no direction in the sky shall evade our gaze. You can be a part of a global net we're stretching to snag that slippery fish in the cosmic pond.

## Finding Out More

Check out The SETI League, Inc., a membership-supported, nonprofit educational and scientific organization, on the Internet at **http://www.setileague.org/**. Leaders in the privatized search for life in space, The SETI League offers technical support, coordination, books, conferences, and a host of related activities for the aspiring SETIzen.

Our extensive web site (over 1500 documents totaling more than 50 megabytes, and growing every week) is aimed at the dedicated amateur radio astronomer who's willing to learn. There you'll find sources for the hardware and software discussed above, along with hundreds of pictures showing how others have put their stations together. We have a technical manual to help you build (and even our own songbook for those who wish to sing SETI's praises).

For membership information, email your postal address to *join@setileague.org*, or drop us a line at P.O. Box 555, Little Ferry NJ 07643 USA. We Know We're Not Alone!

*This feature is updated and reprinted from the May 1998 Satellite Times.*