

Society of Amateur Radio Astronomers, Inc.

The Society of Amateur Radio Astronomers (SARA) is a dedicated group of people that formed an international society to learn, trade technical information and do their own observations of the radio sky.

This organization is a scientific, non-profit group founded for the sole purpose of supporting amateur radio astronomy. SARA was organized in the early 1980's and today has about 350 members worldwide. The group consists of optical astronomers, ham radio operators, engineers, teachers and non-technical persons. Many of our members are new to the field of radio astronomy and membership is extended to all who have an interest in radio astronomy. The remainder of this brochure will answer common questions asked by new members.

Why radio astronomy?

Because about sixty five percent of our current knowledge of the universe has stemmed from radio astronomy alone. The discovery of quasars, pulsars, black holes, the 3K background from the "Big Bang" and the discovery of biochemical hydrogen/carbon molecules are all the result of professional radio astronomy.

Why amateur radio astronomy?

Large professional radio observatories concentrate on deep sky objects for relatively brief periods of time. It's like looking at the universe through a straw. The amateur, on the other hand, looks at broad areas of sky for long periods of time. Although amateurs can not compete with professional astronomers, we do have some benefits. Modern state of the art low noise receiving equipment now enables amateurs to do viable and useful work. Moreover, the amateur has unlimited time which may be devoted to a single observational project.

How do amateurs do radio astronomy?

Radio astronomy may be conducted using either imaging or non-imaging techniques. Non-imaging radio astronomy includes the observation of radio noises from Jupiter, collection of solar flare data, and meteor infall counts. Non-imaging radio astronomy is conducted with very low cost receiving equipment and relatively simple antenna systems. It usually involves modified communications type receivers which receive a narrow band of radio frequencies.

Imaging radio astronomy involves antennas of rather large size, requires radio quiet locations and broadband receiving equipment. The reason for using the broadband equipment is that discrete radio objects radiate over a large spectrum, therefore a greater receiver bandwidth increases the amount of energy received from the object.

What are amateurs actually looking for in the received data?

The aim of the radio amateur is to find something new and unusual. Just as an amateur optical observer hopes to notice a supernova or a new comet, so does an amateur radio observer hope to notice a new radio source, or one whose radiation has changed appreciably.

What is the purpose in all of this observational activity?

The purpose is the same as for any other scientific investigation. That is, to examine the universe, make any discovery possible and let your work be known. This is accomplished by patient, methodical data taking, careful analysis without personal bias, and the publication of the result. For amateur radio astronomers, the SARA Journal is one medium for publication.

What does the average amateur radio telescope consist of?

In general, the amateur radio telescope consists of a good antenna system, a sensitive, stable, low noise receiver, and various output devices. The output may take the form of a strip chart recorder, a voltmeter or a data logging computer.

What kind of observational programs are sponsored by SARA?

SARA presently is encouraging radio observation of the galactic center and the Orion complex for anomalous pulses which are believed to originate from these sources from time to time. The galaxy center mechanism may involve a black hole. Pulses from the Orion complex may be due to a catastrophic processes involving the formation of new stars. In addition, some members of SARA are involved in radio observation of the sun for flare activity at very low frequencies.

Does SARA support SETI?

The search for extraterrestrial intelligence (SETI) is pursued by a few SARA members. While the society does not especially encourage SETI work with instruments of limited capability, we don't discourage it either.

How do I get started?

Just as a long journey begins with the first step, the project you elect must start with a clear idea of your objectives. Do you wish to study the sun? Jupiter? Make meteor counts? Do you wish to engage in imaging radio astronomy? What you decide will not only determine the type of equipment you will need, but also the local radio spectrum. The following is some specific information which may help you decide on a project commensurate with your technical abilities.

VLF solar flare observations

For VLF solar flare observations you will need a strip chart recorder and a radio receiver capable of operating in the noisy 20 to 100 kilohertz radio band. These receivers are quite simple and may be home constructed. We can supply the plans for several type of receivers. There are two equally effective ways to do this work.

- 1) The receiver is tuned to a locally usable part of this radio spectrum and earth atmospheric noises originating from lightning strikes around the equator are monitored. These are conveyed around the earth's surface by the ionospheric D layer. A solar flare causes x-rays to strike the D layer, greatly enriching its electron count. This makes the layer a much more efficient waveguide for this noise and the result is a sudden enhancement of atmospheric noise detected by the receiver and the strip chart recorder.
- 2) An equally effective method in the same radio band is to tune up on a distant, marginally received radio beacon, and look for enhancements of the signal. The end result of a solar flare produces the same data. i.e. a sudden rise in received energy, tailing off to the normal level in a period from 15 minutes to an hour as the D layer once again assumes its normal equilibrium.

Solar flare work in other bands:

Solar flares may also be monitored in all of the free shortwave bands as enhancements of radio noise. We can also supply you with information for this type reception. In general, you would need a good communications receiver, operated without limiters (AGC turned off), a strip chart recorder, and perhaps an audio cassette recorder.

Meteor counts by radio:

Counts of meteor in fall provide valuable data to the American Meteor Society. Radio detection of meteors is about 10 times more effective than optical observations. Moreover, this may be done in the daytime hours. The arrival of a meteor in the earth's upper atmosphere produces a sharp pinging sound of about a second's duration. A good receiver tuned to a marginally received radio beacon and a strip chart recorder or a computer are all you need to get started. A cassette audio recorder is useful during strong meteor showers.

Radio noise observations from Jupiter:

Sporadic noise which is not always present, may be monitored from Jupiter with a good antenna system and a communications receiver tuned to a "dead" portion of the 18 to 22 Mhz radio band. Receivers fully capable of doing the work can be purchased very reasonably at some of the ham radio flea markets. Owners of such receivers may have already heard noise from Jupiter without realizing the source. Once heard it is easily identified. It sounds like frequent rushes of noise, like a rapid ocean surf, punctuated by a quivery subsecond structure. If correlated with transits of Jupiter's inner moon, Io, the data is useful and publishable. Observing is difficult or impossible for three months of the year when Jupiter is close to the sun (an active sun can confuse the data).

Imaging radio astronomy:

This work is best done at the VHF, UHF and microwave frequencies. Paraboloid antennas become viable options at about 1/2 meter wavelengths and below(600 mhz and above). Above 600 mhz you may use phased arrays of antennas such as Yagis and helices. Read-out equipment includes a D.C. amplifier, strip chart recorder or a computer. Audio monitoring is also useful to determine if the received noise is truly celestial. Best results for this type of work will only be achieved in radio quiet locations. If your local environment is noisy, it is best to move the observatory to the country. Idle farm land can sometimes be leased quite inexpensively for this purpose. You may also be able to get land to use in a remote county park for such activity with proper approach and proposal to your local county commissioners.

I know a little astronomy and a little about electronics. Can I do useful work?

Yes, and we will help you. Some of our younger members won national science fair competitions through our help. Members that are interested in computer programming, but do not have the facilities to do radio observing may also contribute in the number crunching of data.

Are unsuccessful radio astronomy observations useful?

They certainly are. We publish all carefully prepared papers. Unsuccessful observation reports are useful if for no other reason than to assist others who may also be engaged in similar projects.

Is amateur radio astronomy instrumentation expensive?

Technical information freely circulated in our monthly journal helps amateurs to obtain good low noise equipment from off the shelf assemblies, or to build their own units. The actual cash investment in radio astronomy equipment need not exceed that of any other hobby.

What books can help me get started and learn about the amateur effort?

Some books have been published by SARA members, and others are available from regular book dealers. A more complete reference list is kept by SARA Membership Services. In addition, our Journal regularly publishes book reviews of interest to our members.

What is SARA Membership Services?

The Secretary of our group operates member services. The secretary also keeps the membership list, posts the Journal, handles SARA's non technical correspondence, and forwards all other inquiries to the appropriate persons.

How is SARA governed?

SARA's government consists of four (4) officers and a Board of Directors elected from the membership. A roster of all SARA officers, technical advisors and committee chairpersons is published in each issue of the Journal.

Is SARA incorporated as a nonprofit group?

SARA was incorporated in the state of Alabama in 1987 as a non-profit corporation. This status allows SARA to receive grants and donations with a taxable deduction available to the donor. Our non-profit tax identification number is 2479834. Determining what is a deduction for SARA purposes is the responsibility of you, the taxpayer, and your tax advisor.

What other services are provided to SARA members?

SARA maintains a file of technical project information which is available to members for the cost of duplication and mailing. The society also sponsors annual seminars, which are held at professional observatories. The first was hosted by Dr. John Kraus and Dr. Robert Dixon at the Big Ear radio observatory telescope in Delaware, Ohio. Recent conferences have been held at the National Radio Astronomy Observatory in Greenbank, West Virginia. At this facility, SARA members have been extended the same courtesies given the professionals in the use of lodging and dining facilities. In addition to the opportunity to learn, members also enjoy the friendship and camaraderie of other members. SARA also recognizes outstanding work each year with an awards program.

Is SARA an organization of only professionals?

At our annual seminars, academic titles are disregarded and everyone is on a first name basis. Many of our members have become good friends through their common interest.

Does SARA have any professional guidance?

Many famous names in radio astronomy are associated with SARA, either as technical advisors, honorary, sustaining, or regular members.

Where does the annual dues money go?

SARA spends about seventy five percent of its assets in the preparation and mailing of its monthly journal. The Journal format breaks down to about one third newsletter, one third "how to" information and one third observational and development papers written by its members. The remainder of its assets are spent in promoting excellence in the work through awards and honorariums.

How do I join?

If our work sounds interesting to you please consider joining our group. Your membership includes a year's subscription to the SARA Newsletter and the chance to meet other enthusiasts at the yearly SARA convention.

Membership requires a check to "Society of Amateur Radio Astronomers". Dues are \$24 (US funds) for stateside members, \$16 (US funds) for stateside members 18 years or younger, \$30 (US funds) for Canadian members and \$36(US funds) for foreign members. (1997)

If you live out of the USA, do not send checks, please send postal money orders. It is also important to include a street address, post office boxes are not acceptable for all deliveries.

We would appreciate the following information:

Name: _____
Address: _____
City: _____
State: _____
Zip: _____
Country: _____
Phone: _____

Please include a note of your interests .

Send your application for membership to :

Hal Braschwitz
3623 W. 139 th St.
Cleveland, Ohio 44111
(216) 252-8177

Check into our **free computer BBS at (608) 835-9605** for the latest information or try our web page at **<http://wbs.net/sara.htm>**