FALL 2014

THE MAINE SUN

NEWSLETTER of the Maine Solar Energy Association

August PV Hybrid Workshop

By Richard Komp

In August we had an important four day MESEA solar workshop here at my home in Jonesport. As part of the workshop we built a new type of PV-Hot Water Hybrid collector.

Some History

Back in 1975 I had the idea of combining photovoltaic cells and a solar water heating absorber plate into the same collector. At that time PV cells were very expensive and my idea was to use reflectors to increase the amount of sunlight falling on the PV cell to increase the current output of the cell. However, when you do this the PV cell will get very hot and lose efficiency; so my idea was to use water to cool the PV cell and then utilize the heat removed in a DHW system. With crystalline silicon cells, the loss in efficiency doesn't get large until almost the boiling point of water so I designed the hybrids to have an operating temperature of 140º F (60º C).

In 1979 I got to build the first of the PV-Hot Water hybrids with a 1.8 to 1 concentration ratio, Winston type compound linear parabolic concentrator (CPC) reflector. In 1981 I formed **SunWatt Corporation** to manufacture and sell this type of concentrating Photovoltaic-thermal (CPT) module. We sold over 100 of these 100 to 150 watt modules in the 1980s and I had one on my home in Jonesport.

Installing the PV Hybrid on my home in 1996.

This year, after 26 years and the 120 mph blizzard last March, I had to reroof the south side of the house and we removed the old PV-hybrid to do this. ***Cont. on Page 3***

MESEA Website: **www.mainesolar.org**

The 2014 MESEA Solar Tour

By Richard Komp

MESEA has been holding its **Maine Solar Tour** on the first Saturday of October every year since 1991, and this year the date is **Saturday 4 October**. The Tours are coordinated with the **American Solar Energy Society (ASES) National Solar Tour.** www.ases.org This time we only have two Tours to offer. The Downeast tour with two homes and Midcoast, organized by Mike Mayhew of **Heliotropic Tech.** with three places (and possibly more)

Mike Mayhew's owner-built solar home on our Tour

While the MESEA Solar Tour is shorter than in previous years, we have some new places. Our neighbors may have already seen all the places in their neighborhood, so attendance is down. **Please talk the tour up with your neighbors.**

The **Northeast Sustainable Energy Association (NESEA)** also has some houses in Maine in their part of the **National Solar Tour**. You can go to **www.ases.org** to look at the (not very accurate) ASES Tour map.

INSIDE

The Maine Sun

Newsletter of the Maine Solar Energy Association

The Maine Sun is published four times a year by the Maine Solar Energy Association (MeSEA), a non-profit organization (sister chapter to the North East Sustainable Energy Association).

Our Mission:

We are dedicated to promoting the public awareness and use of:

- solar energy
- energy conservation
- other renewable non-polluting energy sources
- environmental and health awareness building practices throughout the state of Maine

The Maine Sun welcomes articles, submissions, photographs, and letters. Please send editorial materials to the following address: MESEA PO. Box 184 Harrington, ME 04643
Phone: 207-497-2204
E-mail: **sunwatt@juno.com or mainesolarenergyassociation @gmail.com**
Website: **www.mainesolar.org**

Receive the Maine Sun by e-mail or at our website to be green.

Printed on recycled paper.

Calendar of Events

MESEA Website WWW.mainesolar.org
Facebook: *Maine Solar Energy Association*

The 2014 Maine Solar Tour

Saturday, 4 October 2014 – 9 am to 4 pm -- Free

Tour I: Downeast

Organizer: Richard Komp, 17 Rockwell Rd SE, JonesportME 04649, 497- 2204 sunwatt@juno.com www.mainesolar.org

Site I-1**. Harrington**, 44 Heron Cove Rd., Leonore Hildebrandt/Robert Froese, 610-2929
This 2500 sq.ft. home was designed and built in 1990 by the owners. It is off-grid with a 1150 watt PV system and heated by passive solar energy backed by a wood stove. Robert and Leonore, both writers (www.flatbaycollective.org), have practiced sustainable living for over 20 years—harvesting firewood, caring for fruit trees, and growing a vegetable garden.

Site I-2. **Jonesport**, 17 Rockwell Road SE, Richard Komp, 497-2204
Home self –designed and built in 1988 with 500 watt off-grid PV, passive solar heating and 4 TAP air heaters, 'Hypocaust' under-floor thermal mass, wood backup, and PV/thermal hybrid for hot water. Featured in the May-June 1997 *Solar Today*. Look for signs.

Tour III: Midcoast

Organizer:Michael Mayhew 60 Campbell St, Boothbay Harbor ME 04538, 633-1061 e-mail coolsolarguy@yahoo.com **More sites possible**

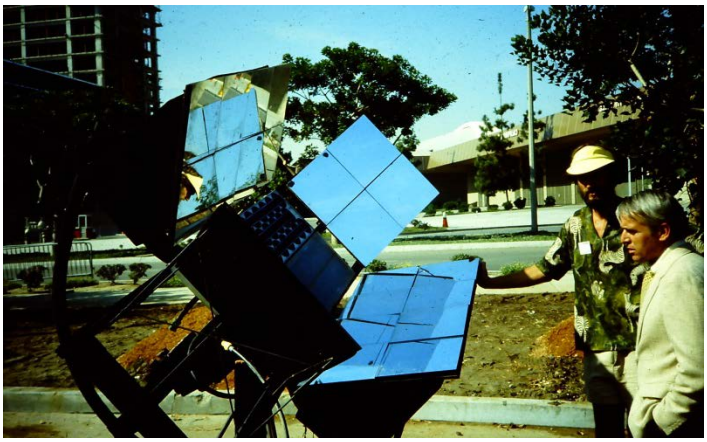
Site III-1 **St. George, The humble Farm,** 785 River Road, Owners: Robert and Marsha Skoglund, 226-
199 yr. old salt box farm house, on St. George peninsula, recently added home-built solar thermal, DHWsystem. Eight, flat-plate panels, collect the sun's rays to pre-heat hot water and heat the cellar floor with non-toxic anti-freeze mixture, two tank system. 5300 watt, grid-connect, PV system, Panels are on owner-built, PV rack on chicken house.

Site III-2 **Boothbay Harbor** Mayhew Residence, 60 Campbell St, 633-1061
Home featured in Solar Home and Green Home tours, has been written up in Portland Press Herald and has been filmed on the Boothbay Region Community TV (http://vimeo.com/17332572). This project is constantly evolving. A 2,900 s.f. Grid Tied PV Cedar-sided contemporary built with local cypress and lots of drift wood. Three levels of decks with great elevated ocean views of Boothbay Harbor. 2.35 kW PV system & solar powered hot water system, attached green house with 1000 gallon thermal storage pond, efficient lighting, condensing boiler, radiant heated floor, passive heating, daylighting and efficient appliances.

Site III-3 **Topsham** Wicked Joe Coffee Roasters, 35 Canam Dr, 888-894-2533
The plant haes a new 600 SF Solar Wall, 3000 watts of PVs and electric car charging station for their 2 electric vehicles, located in a 25,000 SF facility that roasts organically grown coffee.

More sites to be added
MESEA Website WWW.mainesolar.org

From Page 1. The Price of photovoltaic modules has dropped sharply. When I started selling the PV-Hybrid back in 1980s, the price of PV modules was about $40 per watt in present day dollars. Now MESEA has a bulk purchase program where you can buy high quality Certified PV modules for $1 per watt. I realized that the cost of the reflectors and special case we built was more than the cost of simply using more PV cells to get the same performance. Therefore we decided to try an old idea others had tried, simply building a thermal heat transfer device on the back of a standard commercial PV module.



Homemade PV Hybrid made in 1982 using a standard PV module. The inventor (shown with his hand on the Hybrid) added mirror tiles. San Diego, California. (*R Komp photo)*

I also have photos of similar PV Hybrids that wer made over the past decades. Crowder College, where I gave a set of PV Hybrid workshops in the 1980s, had a set of them on their Solar Decathlon home in 2002 and the Chewonki Institute in Maine, where I also gave solar workshops, has both PV hot water and hot air hybrids, installed on two of their buildings in the 1990s.

The Present Last August we had a solar workshop at my home in Jonesport where we modified a 245 watt Canadian Solar crystalline silicon PV Module. The first job was to build a copper tubing array of risers and headers (the plans for these parts are in our **Maine Solar Primer 2nd Edition**). We used a chassis pumch to make ¾" holes in the aluminum frame sides, and used insulating butyl caulk for the hole grommets.

The copper array set into the back of the PV module

The copper array is symmetrically placed in the back of the case so that the module can be used in any position and the tube end unions will be lined up from one module and the next. The copper array is not touching the back of the PV array, but a thin aluminum absorber plate is glued to the Dupont Tedlar (poly-vinyl-fluoride) backsheet. Soni Biehl, our MESEA treasurer was in charge of this operation. She cut a 4ft wide sheet of the 5 mil (76 micron) aluminum sheet we used and dry fitted it to fill the space between the copper tubes and trimming to fit, using a piece of wood as a squeegee to flatten the aluminum and make U-bends up over the copper tubing . We then coated the Tedlar backsheet with ordinary 100% silicone caulk (the kind that smells like vinegar). That silicone caulk is a good conductor of heat, even though it is a good electrical insulator.. After putting the same silicone caulk in the bottom of the U-bends, Soni then laid the aluminum sheet in place in the module case and squeegeed it down onto the fresh silicone.

While the center section was one sheet of aluminum, we fitted small scrap pieces of aluminum sheet onto the copper headers to completely cover the rest of the back, which will have insulation.

Nurudeen, my intern from Nigeria and I with the finished PV-hot water Hybrid module, which will get ½" of insulation.

This module has not been installed yet and has not been tested (except for leaks in the tubing) so I don't yet have any information on its operation. However, the cooling effect of the water in the back should make the PV cells slightly more efficient so the electrical performance should go up on the average. I am leaving in early October for Ghana to give a solar course at a university in Accra, then going to Nicaragua and Indonesia, so this module will not get installed until I have time next Spring to hook it up to my home's plumbing system. I have fastened several thermocouples to the module and intend to make sufficient measurements to produce an ***F-curve*** and other data on the efficiency and performance of the finished modules. We will install two hybrids in parallel on the living room roof of the home, near where the previous hybrid was installed.

This is a work in progress but I will write up a full report when I have the scientific data. This design cannot be patented, since so many people have already tried out the idea, so feel free to go ahead and do this yourself. Also feel free to contact me with comments or questions. My e-mail is ***sunwatt@juno.com.***

Internship with Dr. Komp

By Nurudeen Huthman

I was born in Lagos, Nigeria. I am currently a student at Kettering University pursuing a master's in Electrical Engineering. I have been involved in organizations such as Engineers Without Borders (EWB), Model United Nations and Kagle Leadership Initiatives. I have had the opportunity to travel and impact lives all over the world from Mexico to South Africa to Haiti as well as Kettering's home base in the city of Flint MI. I love to play and watch soccer. I spent the last three weeks in Jonesport ME as an intern for Dr. Komp. I will highlight some of my experiences in the following paragraphs.

How I heard about Maine Solar and Dr. Komp During one of EWB's planning and debriefing meetings from a recent trip to Haiti, Dr. Laura Sullivan, the faculty advisor for EWB, mentioned that there was an opportunity to intern in Maine working with Dr. Komp and learn about practical solar technologies. Prof. Sullivan and some of the students had learnt about the work Dr. Komp was doing in Mali through the film "**Burning in the Sun**". The documentary was one of the movies chosen to celebrate the annual Global Issues Film Festival at Kettering University. I immediately volunteered to go to Maine.

My motivation for going to Maine I have been interested in solar and getting as much knowledge about technologies in the field. My master's thesis compares implementing solar PVs with grid extension in the community of Busolo, Uganda. I saw this internship as the perfect opportunity to learn about practical solar technologies from someone with ample experience and knowledge in the field. It also provided hands on opportunity to do more implementation of theory.

How I got to Jonesport and where I stayed I met Dr. Komp in Boston at the Boston GreenFest as planned. He was there to give a presentation on his work. We took the Amtrak Downeaster the next day to Portland, Maine. This was my second experience with Amtrak and it was a lot more enjoyable. From Portland, we took the Bus to Augusta where Dr. Komp's Honda Insight was parked. The Insight was having some problems but after a computer reset, everything was relatively good and we were on our way to Jonesport. We took the back roads on our way just in case the Insight developed additional problems. It was nice to see some of the breathtaking views Maine has to offer. I was also able to enjoy a meal at Helen's in Ellsworth, where I was introduced to local seafood and the mandatory blueberry pie. We arrived safely that evening at Dr. Komp's home. I was fascinated to actually be able to see and experience an off grid solar home. I'd be staying with Dr. Komp here for the next three weeks. I learnt a lot about how the house works and I was even able to help make it function better.

Some of the things I did while in Jonesport During one of the workshops it was noticed that the PV array powering Dr. Komp's home wasn't producing the amount of power expected. With help from others, we were able to isolate the problem and rewire the arrays to work properly. At the end of the fix, the nominal 750W-combined array was producing over 18A, charging the 24v battery bank. This fix ensured we had enough power to last through every night as well as for the hybrid solar workshop during the day.

I also participated in the hybrid solar workshop held at Dr. Komp's home. The hybrid solar workshop's aim was to modify a PV panel to provide hot water to a building as well as improve the efficiency of the solar panel. As temperature increases, the efficiency of PVs decreases. The idea is to take this heat from the panels and use it to heat water. To do this, we lay aluminum sheet on the back of the panel and used silicone caulk to glue the aluminum to the back of the panel. On top of this we lay copper tubes to allow the transfer of liquid. In a tropical climate, the rest of the work would be to transfer the heated water to a storage container through thermo siphoning. However, because of the climate of Maine one cannot simply use water because it would freeze during the cold winter nights. So instead an antifreeze and water mixture was used in the copper tubing. Using antifreeze necessitates the use of a heat exchanger to transfer the heat from the antifreeze mixture to the water. The heat exchanger is made up of copper tubing. The design is simple but proper care has to be taken when drilling the holes and soldering. An exhaustive procedure is available by contacting Maine solar at www.mainesolar.org. It was nice to meet and work with the workshop participants from near Jonesport and as far as Boston. The gentleman from Boston, Mr. Schneider, also had a solar system on wheels he needed fixing that Dr. Komp and I worked on.

Nurudeen Working on the "Solar on Wheels" trailer.

The solar on wheels is actually a trailer rigged with all the tools needed to power a home using solar. It was intended to power a cabin on an island in Canada that lost power because of a broken underground power line. In order to avoid paying the astronomical cost needed to replace the cabling, island residents decided to go it solo. Mr. Schneider decided to go solar so he bought a ready-made system with a 500W PV array and 9.6kWh battery bank already installed on the trailer. Unfortunately, the system wasn't charging the batteries adequately and there was a slight shock when he touched the PV panels. In order to fix the problem Dr. Komp and I reviewed the wiring and discovered that the series wiring of the panels was creating a very large voltage, up to 80v at times. This type of wiring is not suitable for the application so I rewired the panels in parallel. We also bypassed some unnecessary DC connects and the system started to function as expected. It was nice to hear from Mr. Schneider that his system was functioning as expected.

I had the opportunity to construct solar modules for charging cellphones. As an active member of the Engineers Without Borders club at Kettering University, I was excited to learn that I would have the opportunity to put together a solar cellphone charger. From my travels helping with developing and implementing sustainable clean water technology, one of the frequent requests we receive is something relating to cellphones. It could range from cellphone towers to power for cellphones. We always say no to these requests because it is out of our scope. However, practical technology such as solar chargers that community members can build themselves can help us as we develop trust with the community. It also has the potential to inspire commercial instincts and improve the standard of living if they so desire. Dr. Komp was very graceful in showing me the process of putting a module together from broken/discarded solar cells. The process isn't hard and materials are usually available locally. Although this charger can't charge my iPhone, due to Apple proprietary design, it works for almost any other kind of phone especially those that one would expect to find in rural communities around the world.

Rich Komp in an old 2000 Honda Insight being converted to a solar-electric plug-in hybrid car.

Another cool project I worked on was building a solar module to charge Dr. Komp's secondary battery in his Honda insight. A third module used a different encapsulation method than the previous modules (Silicon Caulk). EVA (Ethylene-vinyl acetate) was used for this module. EVA needs to be melted at relatively high temperatures preferably in an oven or solar cooker. We attempted to melt it over a wood stove with sheet metal base but it didn't work out as planned. I took the panel back to MI and hope to reheat it. More extensive explanations of how encapsulation of the cells is done can be gotten from the Maine Solar website and scientific papers from Dr. Komp.

As the saying goes "All work and no play makes Jack a dull boy". What I did outside project work while in Jonesport. I'm glad to let you know that I visited numerous places around the Jonesport area. I had the opportunity to visit Machias, the seat of the county, a number of times, eat freshly caught lobster from the Atlantic, visit Acadia National Park and enjoy its stunning views as well as visit an actual beach in Roque Bluffs. I was also able to enjoy some of the must do's such eat Helen's blueberry pie and enjoy the view of the cosmos with a telescope from the deck of Dr. Komp's home.

Nurudeen looking at the MDI Biolabs building on Mt. Desert Island Dr Komp was one of the architects who designed the "old" (closer) part of the LEED Certified building. He calls it "L.L. Bean Colonial" architecture.

Nurudeen enjoying the beach at Rogue Bluffs.

What I learned and how will it help me in the future I take away from this trip an increased knowledge of practical solar tools as well as an enhanced insight of the unlimited potential for solar to solve problems worldwide. My plan for the future is to GRADUATE with my masters (completing my thesis) and find employment in the solar PV industry developing small and large-scale PV systems. In the short term, I will be helping EWB set up a solar lab where students and community members can learn about how to build and apply practical solar technologies. In the very long term (5-6 years) I hope to be in Nigeria helping to improve the standard of living of all Nigerians, rural and urban, with solar knowledge. This experience will be vital in the way I think about solving energy problems throughout my life as an Engineer.

I want to take this opportunity to say thank you to Dr. Laura Sullivan for clueing me into this opportunity and coming out to Maine to see me. Also this would not have been possible without Dr. Komp and Mr. John Burke.

Innovations and Climate Protection

By John Burke

I for one, won't wait for the man from Apple or anywhere else to come up with a new gadget' to allow me to get a little better output from my solar power.

Innovations are always coming up the pike, and many do add to the efficiency and performance of earlier 'innovations' in solar energy development. The 'basic' solar concept has existed for hundreds, if not thousands of years. The ancient cliff-dwellers, as well as the Romans utilized the basic concepts of solar energy and heat flow to design their homes and systems to live in the seasonal areas of the earth.

The technology we need to save the climate and environment exists now, the innovations will add a % of efficiency, here and there, but they are mostly for 'a small profit', for the benefit of the few. There are many ideas that researchers and thinkers will present for funding, to those who have the resources available to invest. You may know that a majority of investment opportunities don't pan out, in any area, renewables included.

There are those who favor expanded use of fossil fuels and nuclear power, as a 'bridge' for the 'development' of a 'better' solar technology. The technology exists now in wind and solar power, no innovations are necessary. It's the 'political will' of the 'people' that is required. We can't wait for the government. or the politicians, or the 'industry', to serve up the expanded solar tech on a silver platter that we all can 'plug in and play', or we're doomed to waiting. The innovations were made a hundred years ago and shelved by the big corporations, for their benefit (profit), at the time.

It's up to you, as an individual to act for your family and the planet; to live a life with regard to clean water, air and an environment for a future, so our grandchildren can exist here. The garden is not being tilled, the energy of our nuke, 93.000.000 miles away, is hitting the earth every day! As we remembered the other night, approximately 150 sq. miles of the Sahara desert, will produce enough power for the entire population of the Earth, the distribution is the only problem. So, if the solar power is utilized on each building that is now in use, around the world, we can surely be producing the power necessary, and then some. Let's stop, and think, and act, for the good of the future generations, the time is **Now** !

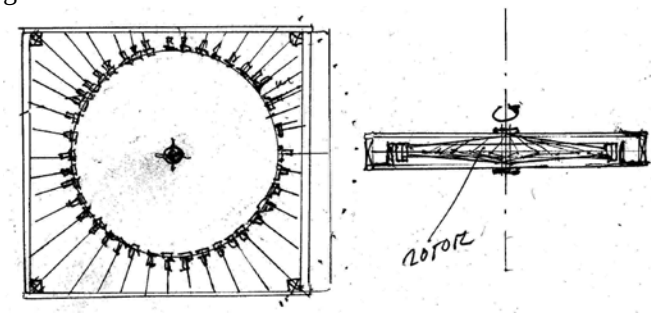
We can exist without the Resource wars, we can produce our own organic food, without 'commuting' to a job, to supply money to purchase food, grown and transported around the world. We can live in self-sufficient communities, sharing with our neighboring communities. The borders are set up for the benefit of the few. Will we realize our full potential in time for the future ? I look forward to hearing from you ... Thanks !

A Raft-Mounted Tidal Power Generator in Passamaquoddy Bay

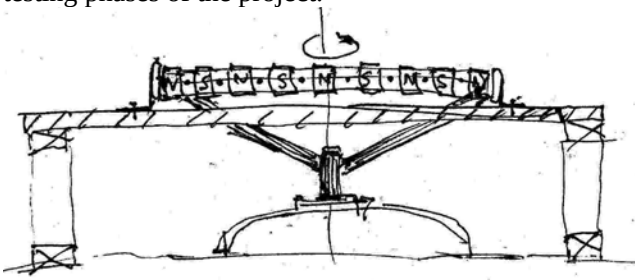
By Walther Wefel

SEADS, a non-profit based in Columbia, Maine, is partnering with the Passamaquoddy Tribe in the development of a small-scale vertical axis floating platform tidal power generator. Dr. Normand LaBerge is the Administrator for the project as well as heading the research effort on the hydro side.

SEADS is responsible for the development of a low RPM electrical dynamo. The first phase of the project will result in a prototype experimental platform which can be further developed and scaled up for future power generation uses.



The tidal current powered turbine is a floating vertical axis (orthogonal flow) turbine designed and built by Dr. Normand LaBerge, Keith Moore and Doug Leighton members of the team based at Pleasant Point. The Passamaquoddy Tribe has advanced capabilities for tidal current mapping which will be employed in the siting and testing phases of the project.



SEADS has adapted some ideas f rom Hugh Piggott's “A Wind Power Recipe Book” and designed a low RPM vertical axis dynamo using neodymium permanent magnets and copper induction coils. The dynamo will also be used in future SEADS wind power projects (see gofundme link below). On the SEADS team are Charles Ewing, Dr. Rich Komp and Walther Wefel. Sea trials will begin in late September at Sipayik in Quoddy Bay.

Contact: seadsmaine@yahoo.com SEADS VAWT project

http://www.gofundme.com/7r75jg

Another Example of Carbon Establishment Propaganda

Every example will LOWER costs, not raise them!

The **Institute for Energy Research** released today a list of the Obama administration's actions that are aimed at increasing the cost of energy for American families. The list includes over 100 actions taken by the administration including:

An Outer Continental Shelf (OCS) plan that closed the vast majority of the OCS from future energy production.

Solyndra, the poster-child for President Obama's "green" energy policies, filed for bankruptcy, despite receiving a $535 million loan from U.S. taxpayers. *95% of loans were paid back*

A plan to close off 75 percent of Western oil shale—70 percent of which is on federal lands—to development.

The Mercury and Air Toxics Standards (also known as Utility MACT), which will force plant closures, cause 33 gigawatts of *(coal)* electric power to go offline and raise electricity rates for all ratepayers.

A Renewable Fuel Standards (RFS) proposal that calls for 17 million gallons of cellulosic biofuels in 2014 As of August 2014 producers have only been able to generate 72,000 gallons due to cost and complexity of the process.

A rule to regulate carbon dioxide emissions from existing power plants EPA says costs will be about $8.8 billion, while other estimates of similar plans predict costs as high as $480 billion. *And they have other "examples" - RK*

They are trying really hard to keep us from using renewable energy and conservation.

Coming: The Third Edition

Now 36 pages with new material

The Maine Solar Primer

A compilation of practical information and diagrams from past issues of THE MAINE SUN

The Maine Solar Energy association has published a sourcebook for solar and other renewable energy resources in Maine and New England.
This booklet includes do it yourself plans and basic solar information for everybody.

The Maine Solar Primer is available for $12 inc. postage from MESEA, PO Box 184, Harrington ME 04643

MeSEA Membership Form

Annual membership includes: a subscription to the quarterly MeSEA publication - *The Maine Sun*, 10% discount on workshop fees and MeSEA-sponsored events, networking with other like-minded people in Maine, contribution to the sustainability of our program, and the right to declare your donation to a 501(c)(3) on your taxes.

Special Joint MESEA – ASES Membership: $60 ***Go to the www.ases.org/join/ website to sign up with a credit card.***

Name(s): _____

Address: _____

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Individual MESEA membership - $30.

□ new □ renewal □ upgrading

Family MESEA membership - $50. □

Lifetime MESEA membership - $1000. □

Corporate MESEA membership - $150.□ **

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