

Mississippi Society of Radiologic Technologists

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A proud affiliate of the **ast**

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Mississippi Society of Radiologic Technologists Affiliated with the American Society of Radiologic Technologists

Happy 2023! I am truly honored for the opportunity to serve as President of the Mississippi Society of Radiologic Technologists for the upcoming year. It is a blessing to be part of such an amazing organization. Because of the dedication and hard work of the MSRT's Board of Directors and its members, our society is strong and continues to grow. I look forward to working with the Board of Directors to ensure our tradition of strong leadership continues.

We were so happy that Natchez was able to host our annual conference this past October. I would like to thank everyone who worked tirelessly behind the scenes to ensure the MSRT's 80th annual conference was a success. The location and dates for the 81st annual conference will be forthcoming. Please keep an eye on the MSRT website and Facebook page for updated information. We look forward to having you all join us at this year's conference!

It is more important than ever to strengthen the voice of our profession! One way to accomplish this is to get involved. Please contact a member of the Board if you would like information on how you can help. Volunteering is a wonderful way to network, build a resume, develop new leadership skills, meet others, and give back to our profession!

I am excited to see what is in store for 2023 and am again thankful for the opportunity to serve as president of the MSRT!

Sincerely,

Jessica Reid B.S., R.T. (R) MSRT President



Mississippi Society of Radiologic Technologists Affiliated with the American Society of Radiologic Technologists

The **MSRT Business Meeting** for the 80th Annual Conference was held at The Natchez Convention Center in Natchez, MS, on October 25, 2022. Dr. Asher Beam, President of the MSRT, welcomed those present and thanked everyone for attending conference.

A quorum was established, and the meeting was called to order by the MSRT President, Dr. Asher Beam, at approximately 4:19 p.m.

The minutes from Conference 2021 were accepted as published in the BEAM.

The following reports were given:

- 1. Treasurer:
 - a. Please refer to Appendix A for Annual Financial Report that was presented at the business meeting.
- 2. Vice President: Nothing to report.
- 3. Secretary: Nothing to report.
- 4. Editor of The Beam: Nothing to report.
- ASRT Affiliate Delegates: Dr. Mike Ketchum and Dr. Lee Brown represented the MSRT as ASRT Affiliate Delegates at the June 2022 ASRT House of Delegates Meeting.
- 7. Operating budget:
 - a. Dr. Lee Brown Chairman of the Board, presented the proposed operating budget for 2022-2023 that was approved by the board. (See Appendix B)
- 8. President:
 - a. Dr. Asher Beam discussed the MSRT website redesign and document compliance.
- 9. Conference Coordinator/Conference Chair:

a. Expressed gratitude for the attendees being present at conference and stated that Conference 2022 had 161 registrants that preregistered.

- 10. Committee Chairs: Nothing to report.
- 11. Nominations
 - a. President- Jessica Reid
 - b. Vice President- Zack Gray
 - c. Secretary- Brittany Barron
 - d. ASRT Affiliate Delegate- Zack Gray

Old Business

MSRT Districts

The Board of Directors voted at the preconference board meeting to set the number of districts in the affiliate society to zero. Due to the MSRT Bylaws, the board of directors has the power to make this decision.

With no further business to be discussed, the meeting adjourned at approximately 4:32 p.m.

Respectfully submitted,

Brittany W. Barron, M.H.S., R.T. (R)(M)(CT)(ARRT)



Asher Street Beam, DHA, R.T.(R)(MR), MRSO







Conference Speakers

2022



Becky Hollis, R.T.(R)(M)(QM)



Robert McClung, Ed.D., R.T.(R)



Daniel DeMaio, M.Ed., R.T.(R)(CT)



Deborah Shell, M.Ed., R.T.(R)



Brandon Smith, MBA, M.S.R.S., R.T.(R)(VI), CIIP

Conference Speakers

2022





Richard "Fuge" Fucillo, R.T.(R)(CT)

Kristi Moore, Ph.D., R.T.(R)(CT) Monica Weber, M.S.R.S., R.T.(R)(M) Allison Puente, M.S.R.S., R.T.(R)(CT)



Cathy Cooper, M.S., R.T.(R)(CT)(BD)



Donna Cleveland, M.Ed., R.T.(R)(M); RDMS (AB/BR/OB/GYN)

Student Manuscripts

All student's papers were mailed to three (3) out of state judges for the student manuscript competition. Pictured below are the students whose papers were selected for manuscript competition.

- "Trauma in CT: Survival Rates and Incidental Findings" by Marla Beach
- "Implementing Augmented Reality in Radiology" by Caden Harrell 3rd Place
- "Positron Emission Tomography Scanning" by Tavia Keys 1st Place
- "Advances in Diagnostic Imaging in Diagnosing CTE in the Living" by Kadie Lee
- "Therapeutic Ratios in Radiation Therapy" by Jenny Legg
- "Utilization of Positron Emission Tomography for Major Depressive Disorder" by AJ Wallach 2nd Place
- "Geriatric Radiology" by Anna Wilson





1st Place



"Augmented Reality" Caden Harrell



2nd Place



"The Future is Bright: Hierarchical Phase Contrast Imaging" Brooklyn Baldwin, Katie Cangemi, Dally Munn, Haley Bynum



3rd Place



"The Dark Side of Radiology" Hannah Garrett, Hannah Henderson, Jacob Hearn

Student Exhibits



Student Exhibits



Student Exhibits



Student Exhibits



Student Exhibits



Student Exhibits



<u>Student Manuscript 1st Place Recipient</u> <u>Tavia Keys</u>

Positron Emission Tomography (PET) Scanning

The field of radiology contains a wide range of modalities including x-ray, computed tomography, MRI, nuclear medicine, PET, and radiation therapy. Each of these modalities have their own unique specialties allowing physicians a more in-depth look of the human body. Although all modalities in the radiology field are essential to health care, one specialty in particular, Positron Emission Tomography (PET), is far more advanced due to its capability of identifying early onset forms of diseases or cancer.

Positron Emission Tomography (PET) scanning was developed in 1973 by Professor Michael E. Phelps ("Fermi Michael E. Phelps"). Born and raised in Cleveland, Ohio in 1939, Michael E. Phelps earned his B.S. in Mathematics and Chemistry from Western Washington State University in 1965, and his Ph.D. in Chemistry from Washington University, St. Louis, in 1970 (par. 6). In 1975, Phelps began his career in education and eventually became a professor of Radiological Sciences and Biomathematics (par. 6). Professor Phelps initially began his discovery by applying the basic sciences of nuclear physics, chemistry, and mathematics to biomedical imaging (par. 3). By recognizing that positron decay provides the opportunity for a unique coincidence detecting system and by configuring a circumferential array of detectors that utilize electronics and a mathematical algorithm, Phelps developed three-dimensional tomographic images of biological probes of the living human body (par. 3). He later discovered that the positron-emitting forms of oxygen, nitrogen, carbon, and fluorine assisted in detecting biological processes in the human body (par. 3). These discoveries led to the invention of the first Positron Emission Tomography (PET) scanner in 1973.

A PET scan is a type of nuclear medicine imaging test ordered by a physician that allows for specific diseases to be detected within the body ("Positron Emission Tomography (PET)"). To obtain this special scan, radioactive tracers or radiopharmaceuticals, become extremely useful

in the fact that they are consumed in the body via three different ways: swallowed, inhaled, or injected into a vein in the arm through an intravenous line (Krans). The most frequently used radioactive tracer is fluorodeoxyglucose (FDG), which is a molecule similar to glucose ("Positron Emission Tomography - (PET/CT)"). The radiopharmaceuticals that are administered into the body are created by attaching a radioactive atom to a specific chemical substance that will be naturally metabolized by the particular organ or tissue being examined ("Positron Emission Tomography (PET)"). After entering the body, the radioactive tracers are absorbed by the specific organs and/or tissues of interest to help diagnose and assess various medical conditions that would otherwise go undetected by other imaging modalities such as x-ray, CT, or MRI (par. 3). Because this particular radioactive tracer is similar to glucose and cancer cells tend to absorb glucose at a higher rate, the cancer cells will stand on the image ("How PET Scans Work"). The areas in the body where the radioactive tracer or radiopharmaceutical accumulates will appear brighter than the normal tissues on the images ("Pet Scan," Better Health). Not only is a PET scan useful in detecting various diseases and cancers, but it can also be used to measure vital body functions such as oxygen levels and blood flow, as well as assist the healthcare provider with determining if certain treatment plans are working effectively ("PET Scan: Tests"). A PET scan is known to be a preferably more accurate examination to assist in diagnosing either a malignant or benign tumor and allows physicians to propose alternative treatment plans in hopes of reducing the possibilities of ongoing surgeries ("Positron Emission Tomography – PET Scan"). In order to achieve a successful scan, the PET scanner undergoes precise steps to obtain an adequate result. The scanner used for PET appears similar to a conventional CT scanner, almost resembling a giant doughnut with a large hole in the center and an adjustable table, but

functions differently to produce a quality image ("Positron Emission Tomography (PET/CT)"). Once the radioactive tracer or radiopharmaceutical is administered into the body, the scanner slowly moves over the part of the body being evaluated ("Positron Emission Tomography (PET)"). During the breakdown process of these radionuclides, positrons are emitted and collide with nearby electrons, thus creating gamma rays called annihilation photons (par. 11). As the scanner is moving over the patient it detects these annihilation photons, which allows the computer system to analyze the information and produce an image of the specific organs or tissues that were initially targeted (par. 11). Once the image is processed and ready for display, the radiologist is then able to meticulously evaluate the organs and/or tissues for the presence of disease or other conditions. There are a few risks associated with undergoing a PET scan. The first risk is from the radioactive materials administered to the patient internally, meaning the patient is being exposed to certain levels of radiation from within the body ("Pet Scan," Mayfield). However, due to the short half-lives of the radioactive materials used in these studies, the radiation exposure is limited (par. 11). The materials breakdown rapidly and are eliminated from the body via the kidneys (par. 11). The second risk associated with PET comes from the scanner, which exposes the patient to an external radiation source (Greer). The radiation dose received from these radioactive materials is equivalent to several years of natural background radiation a person may receive from the natural environment (Hofman & Nandurkar). Because of the radiation risks associated with PET scanning, it is imperative to exercise ALARA (As Low As Reasonably Achievable) and apply the three cardinal principles of radiation safety: time, distance, and shielding. In addition to radiation risks, there are other risks or discomforts the patient may experience. Patients may experience claustrophobia during the PET scan that can vary in time

depending on the body part being examined, therefore a mild sedative could be given to the patient to help relieve this discomfort (par. 21). Some patients could also have an allergic reaction to these radioactive tracers. In such cases, medication is readily available to quickly alleviate any such reactions ("PET Scan: Tests"). Overall, the potential benefits of having a PET scan outweigh the minimal risk of radiation exposure ("Positron Emission Tomography – (PET/CT)"). PET scans are capable of discovering early stages of cancer, distinguish a tumor's exact location, assess different types of neurological diseases such as epilepsy, Alzheimer's, and Parkinson's, as well as detect various cardiovascular diseases and monitor the heart's blood flow and functionality ("Pet Scan," Better Health). Specifically, after a myocardial infarction, the scan will reveal different parts of the heart impacted due to a decrease in blood flow and will further assist physicians with future preparations concerning surgical treatments (par. 8). The invention of the PET scan by Professor Michael E. Phelps in 1973 has paved the way for early diagnosis and treatments of various diseases, which has revolutionized the world of health care.

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Technologist Manuscripts

Radiologic technologists have the opportunity to participate in the RT category of both manuscript and exhibit also. All technologist's papers were mailed to three (3) out of state judges for the manuscript competition. Pictured below are the students whose papers were selected for manuscript competition.

- "Teratomas: Diagnosis and Discussion" by Ricky Cain 3rd Place
- "Prostate Specific Membrane Antigen" by Emily Causey 1st Place
- "Anxieties within Magnetic Resonance Imaging" by Shae Miller 2nd Place
- "Magnetic Resonance Imaging to Diagnose Brain Tumors" by Victoria Wright



Technologist Exhibits

1st Place



"Hungry for a Diagnosis" Emily Causey

Technologist Exhibits

2nd Place



"Bone Scintigraphy" Katie Rock

Technologist Exhibits

3rd Place



"PET Imaging in the Detection of Alzheimer's Disease" Emmy Hinds

Technologist Exhibits



<u>Technologist Manuscript 1st Place Recipient</u> <u>Emily Causey</u> <u>Prostate Membrane Specific Antigen</u>

As of 2021, prostate cancer (PCa) is the second most common malignancy and the sixth leading cause of cancer-related death in men (Debnath et al., 2022). Depending on the development of the tumor, patients will receive treatments ranging from total prostatectomy to radiation therapy (Wang et al., 2022). "The 5-year relative survival rate for localized prostate cancer is 100%, whereas for metastatic prostate cancer it becomes only 30%" (Debnath et al., 2022). Patients will continue to have their labs monitored after treatment. If there is a rise in the prostate-specific antigen (PSA) levels, prostate cancer has returned. Up to 40% of men treated for PCa within ten years can have a recurrence. A clinician will decide if the patient will undergo salvage radio-therapy imaging observations based on the rate of the PSA, cancer grade, and stage of diagnosis (Mena et al., 2022). Several imaging methods help study the spread and staging of prostate cancer, and evaluate cancer's response to treatment (Emmett, 2022). In recent years, the use of radiotracers to target the prostate-specific membrane antigens (PSMA) has helped detect sites of cancer not so easily observed when using other modalities. Positron emission tomography/computerized tomography (PET/CT) is a molecular imaging modality that aids in supplying information through radiotracers that bind to prostate-specific membrane antigen (PSMA) (Mena et al., 2022).

PSMA

Prostate-specific membrane antigen (PSMA) is a type two transmembrane glycoprotein that exhibits on endothelial cells. It consists of three parts: 19 amino acid internal domain, 24 amino acid transmembrane domain, and a 707 amino acid external domain. It is in the cytosol of healthy prostate cells and then relocates to membrane-bound proteins in the presence of prostate cancer. Despite its name, PSMA is also in the gastrointestinal system, kidneys, salivary glands, brain, and other malignancies (Afshar-Oromieh et al., 2016). The more undifferentiated and advanced the PCa tissue is, the more elevated the expression levels. The relationship between the two implies that PSMA plays a valuable role in the progression of PCa (Wang et al., 2022).

PSMA has displayed higher advantages as markers for prostate cancer imaging and therapy over other surfaces of cells. It expresses weakly within healthy tissues but can be elevated to 100-1000 fold

higher in malignancies within the lymph nodes and bone metastases. In immunohistochemical analysis, 94% of prostate cancer samples showed evidence of PSMA expressions (Debnath et al., 2022). The expression levels are higher in poorly differentiated, metastatic, and castration-resistant prostate cancer tissues (Wang et al., 2022). A characteristic that helps targeted therapy is that the PSMA has a transmembrane conformational structure that can bind to agents through endosomal complexes. The antigens belong to an enzyme class of carboxypeptidases with the underlying layer of peptides with C-terminal glutamate. As such, various kinds of tiny molecule PSMA inhibitors have been invented and radiolabeled with a variety of radioisotopes. PSMA as an antigen protein and enzyme serves as helpful tools in the development of imaging and therapy (Debnath et al., 2022). The biological features validate it as PET imaging marker, and that biomarker aids in the localization, grading, and staging of prostate cancer (Bravaccini et al., 2018).

PMSA Imaging

Tracers

The evolution of imaging prostate cancer has improved with the introduction of multiple new tracers used in PET/CT. In the past, 11C-choline and 18F-choline PET/CT were primarily used in studying prostate cancer. It worked with accurately staging and studying the recurrence of PCa. However, some disadvantages were the price, lack of availability, and low sensitivity (Castellucci et al., 2018). Over the past ten years, fluorodeoxyglucose (18F-FDG) has been the most commonly used tracer in scanning patients with cancer. FDG has a high sensitivity in detecting the recurrence of cancer like lung or breast but detecting prostate cancer is not as simple (Kichloo et al., 2020). PCa has a low avidity for FDG, and overlapping with benign lesions or a healthy prostate through the uptake process may occur (Velloso and Fraile, 2018). Prostate cancer is a complex disease that has several levels of aggressiveness, so it is vital that the tracer can detect cancer. PSMA functions as a biomarker, so the use of PSMA-PET/CT and proper radiotracers that target PSMA have played a key role in localizing sites of recurrence at the time of the elevation of PSA levels has led to the development of low molecular weight tracers attracted to the PSMA receptor (Velloso and Fraile, 2018).

The United States Food and Drug Administration (FDA) recently approved two PSMA-targeting radiotracers: Gallium-68 (68Ga) and Fluorine-18 (18F). These tracers work well for patients with low PSA levels. They supply elevated levels of sensitivity and specificity over older PET tracers in outlining the profiles of recurrent or metastatic prostate cancer (Debnath et al., 2022). Fluorine and gallium-labeled PSMA peptides are found to have the most diagnostic accuracies. The most common tracer for prostate cancer imaging is gallium-68 (Emmett, 2020). It is more sensitive and specific in patients with low PSA levels. Although it does not detect all recurrences and other PSMA expressing cancers, it detects better than 18F-FDG (Velloso, 2018). In 2016, the FDA approved a new effective PET tracer, which is a synthetic amino acidic isotope named 18F-Flucyclovine. It is an amino acid with a metabolic uptake mechanism that can uptake within various malignancies like prostate cancer which has both high and low glycolysis. The main advantage of Flucyclovine is that the background activity in the abdomen and pelvis is low and makes image reading easier for a physician. It can also have a higher tracer uptake that connects to more aggressive tumors (Castellucci et al., 2018). There are several different PSMA tracers undergoing trials throughout the United States. They vary in small ways but compare equally so far in their diagnostic characteristics.

Protocol

"Currently, PSMA PET/CT has emerged as the best diagnostic tool available for staging PCa patients with biochemical recurrence after definitive therapy, with improved diagnostic accuracy and good correlation with gold standard histopathology for detecting metastatic PCa at low PSA levels" (Mena et al., 2022). A PSMA PET/CT scan involves an intravenous injection of the PSMA radiolabeled peptide. All PSMA PET tracers give a small radioactive dose to the patient, and they will be radioactive for two to three hours. Any excess tracer and radiation will be filtered through the kidneys and excreted by the urine. In addition to the short half-life of PET tracers, there is little to no radioactivity by the next day. Following the injection, the patient will wait during the tracer uptake process. The time varies based on what tracer is used. (Emmett, 2020). The uptake time for 68Ga is 50 to 100 minutes, and then the 18F is 60 minutes (Jadvar et al., 2022). The patient undergoing one of these scans should hydrate well. They will be asked to empty their bladder prior to their scan to reduce the appearance of halo artifacts and

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false-positive readings (Schwarzenboack et al., 2017). It is essential to separate the activity in the urine from activity in the areas of interest. If that patient cannot void correctly, an iodinated contrasted urogram scan can help with the separation of the activities (Jadvar et al., 2022). The injected molecule proteins will bind themselves to the enzymatic part of the PSMA receptor in the cells of prostate cancer. The tracers will detect nearly all levels of prostate cancer from the prostate to sites where metastases occur. The most common metastatic sites are lymph nodes, bone, and viscera. Uptake can be seen in other tissues expressing mild PSMA levels and in certain benign and malignant tumors (Emmett,2020). After the scan, a physician can determine if the PCa has spread, and if the patient is a candidate for further radiotherapy.

PMSA Therapy

"Fortunately, the implementation of PSMA PET imaging has substantially improved the diagnostic accuracy for detecting PCa recurrence with superior sensitivity compared to conventional standard-of-care imaging, at PSA levels low enough that may affect target delineations for routine salvage radiation" (Mena, 2022). Prostate cancer imaging has improved and changed quickly now that there are new PSMA tracers being studied. These diagnostic and therapeutic improvements have brought prostate cancer into a new era of precision medicine (Velloso and Fraile, 2018). The combination of therapy and diagnostics, also called theragnostic, discusses how the radiolabeled proteins attach to the cancer cell. It also shares the same principle of precision medicine of right drug, right time, and right dose (Emmett, 2020). As well as a biomarker for diagnostic imaging, PSMA has become a target marker for radioligand therapy.

Radioligand therapy is a type of treatment that involves injecting a therapeutic dose of radionuclidelabeled tracers. The tracers will bind to specific cells; then, they will release alpha, beta, or Auger electrons. Those electrons create free radicals that cause damage and death to those cells. Radioligand therapy works on a cellular level. The most common radionuclide chosen for these therapies is Lutetium-17 (177Lu). It is a betaemitting radionuclide with a long half-life and short penetration length (Wang et al., 2022). Often 68Ga and 177Lu will work together as a theragnostic pair in clinical trials (Debnath et al., 2022). 177Lu lowered PSA levels, relieved metastatic bone pain, and increased survival, and there are higher objective remission rates and less adverse reactions (Wang et al., 2022).

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Conclusion

In the last decade, the development of PSMA-targeting imaging and therapy has evolved drastically. PSMA PET imaging has become more readily available in clinic settings and is becoming better utilized in detecting recurring PCa than other imaging modalities. PSMA has proven to be an essential biomarker in imaging prostate cancer. With clinical trials currently being studied in the United States, we will see how much further PSMA imaging can evolve and help with the long-term outcomes in the treatment of patients with prostate cancer.

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<u>First Place</u> <u>University of Mississippi Medical Center</u> Front L-R: Caden Harrell, Kristen Roby, AJ Wallach Back L-R: Morgan Bondy, Jenny Legg



<u>Second Place</u> <u>Pearl River Community College</u> Front L-R: Alexis Berry, Tavia Keys, Camryn Dykes Back L-R: Brittney Mischler, McKinley Weeks



<u>Third Place</u> <u>Jones County Junior College</u> Front L-R: Kayla Ensign, Taylor Brooke Martin, Abby Boone Back L-R: Marla Beach, Abby Morris



Copiah Lincoln Community College

Front L-R: Hannah Henderson, Hannah Garrett, Hannah Burgess Back L-R: Catrina Robinson, Sharon Boyd



















MSRT Scholarship Recipients

Each of these students have demonstrated outstanding academic and clinical performance throughout their education. The MSRT Board of Directors salutes them and wishes them well in their future endeavors.

" T H E roots of EDUCATION are bitter, BUT THE ruit IS SWEET."





Congratulations







No image available



Hannah Henderson Co-Lin

Haley Copeland Hinds

Abby Boone Jones







LeeAnne Spencer MS Delta <u>Tavia Keys</u> Pearl River Kadie Lee UMMC

Awards and Recognition



(Above) 3rd Place Student Exhibit presented to Hannah Garrett, Hannah Henderson, and Jacob Hearn



(Above) 1st Place and People's Choice Student Exhibit presented to Caden Harrell.(Below) 2nd Place Technologist Exhibit presented to Katie Rock.



Congratulations!



(Above) 2nd Place Student Exhibit presented to Brooklyn Baldwin, Katie Cangemi, Dally Munn, and Haley Bynum



(Above) 3rd Place Technologist Exhibit presented to Emmy Hinds.(Below) 1st Place Technologist Exhibit presented to Emily Causey.







(Above) 1st Place Technologist Manuscript presented to Emily Causey.

(Above) 1st Place Student Manuscript presented to Tavia Keys.



(Above) 2nd Place Student Manuscript presented to AJ Wallach.(Below) 3rd Place Student Manuscript presented to Caden Harrell.





(Above) 2nd Place Technologist Manuscript presented to Shae Miller.(Below) 3rd Place Technologist Manuscript presented to Ricky Cain.











Left: Recognition for Paula Young and all of the years she has served the MSRT. Below: Kristi Moore being recognized for being awarded Aunt Minnie's Most Effective Radiologic Sciences Educator 2022.



Left: Lee Brown presenting the Past President's Award to Asher Street Beam.



Above: Newly Installed President Jessica Reid after being presented the gavel. Left: Newly installed officers. President Jessica Reid, Vice President Zack Gray, and Secretary Brittany Barron.





Anna Lloyd



Abigayle Adcox





MSRT Costume Party







Letter from the Editor

Hello everyone!

Thank you to everyone who came to Natchez and helped make it another great conference.

Don't forget the MSRT is always looking for new members and volunteers. Something we hold tight to everyday is "there is power in numbers." Whatever it is you can do to help, supporting the MSRT and fighting for our profession is so important right now. Feel free to reach out to any of us on the Board of Directors (names are listed on our website) and we will help you find a way to get involved.

Location and details for 2023 conference will be coming soon. Students, be thinking about and preparing for the Student Prep Bowl that happens at conference. Not only is it a good way to study and be more prepared for registry, it's a fun time! Also, be thinking about the Manuscript and Exhibit Competition. If you have any questions about either of these, reach out to your instructors or anyone with the MSRT.

Thank you all again for your hard work and for being members of the MSRT. See you in October!

Adrian Brewer, R. T. (R)