

# FORT HAYS STATE UNIVERSITY DEPARTMENT OF MATHEMATICS



FORT HAYS STATE  
UNIVERSITY

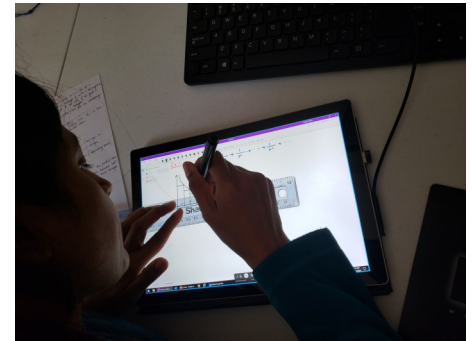
*Forward thinking. World ready.*

Volume 46

Spring 2020

## Ready or NOT— We are ONLINE

For years the faculty of the Math Department have resisted (to put it mildly) the idea of moving all math classes to an online format. How do you teach math online? Is learning math online hard? Students need to be able to ask questions during the lecture, not hours later. Stay at home orders due to COVID-19 have educators (and parents) in all disciplines all over the world currently getting a crash course in online teaching and learning. The Fort Hays Mathematics faculty have received the opportunity to jump, head first, into the world of teaching mathematics online. The results are still being tabulated but some of the best lessons come when we least expect them.



Fort Hays State University and its faculty may be more prepared for this sudden change in education than many universities around the country. Thanks to TigerTech and TILT we have the hardware, software, and plenty of professional development opportunities to be very successful. Each member of the math faculty have adopted their own style in this online environment. While some have encouraged students to read the book, do the homework, and email if you have questions, others are utilizing a “flipped” classroom model, and the rest continue to lecture as normal. In any case, mathematical discussions are being held and stu-

dents have the opportunity to continue learning from their instructor. Many math instructors are using ZOOM and Blackboard Collaborate to meet with students. (I can assure you that the faculty learned more this week than the students.) If you feel you need a refresher course, I am

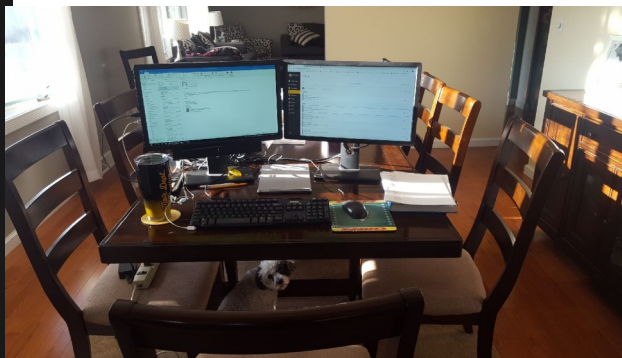
sure you could virtually attend a lecture. Be sure to check with the instructor for permission as we are avoiding “zoom bombing” as much as possible.

Regardless of the format, members of the FHSU Math Department are working hard to provide a quality education to our students.

**The Tiger Family is  
Important and  
Always Welcome!**

**Now more than ever,  
we would love to  
hear from you!!!!**

Great things continue to happen in our department. We cannot succeed without alumni and friends. Your gifts, information, hiring of graduates and interns, and even simple things like spreading the word about the strengths of our department, our students, and faculty, **are all important.** You are **always welcome** to stop and visit with faculty and students!



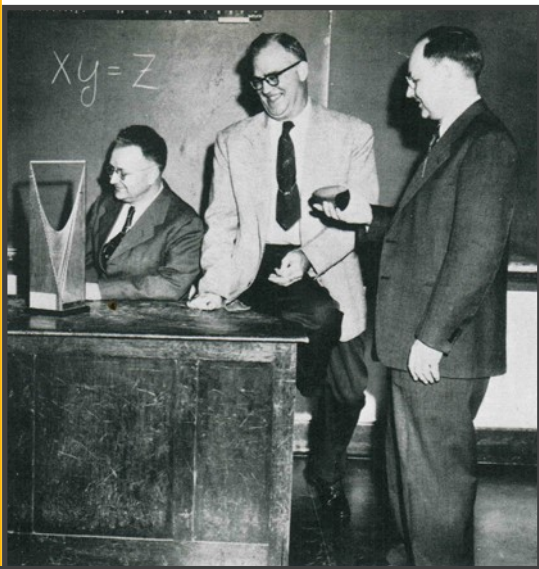
# An Accidental Physicist's Career: A Journey from FHSU in 1960 to Retirement in 2010

by Merrill Milham

**Authors Note:** Mr. Millham is a generous donor to the Fort Hays State University Mathematics and Physics Departments.

One workday, probably in the late 1980s, I was at my desk copying some hastily scribbled equations from my blackboard into my notebook. It was early in the day and so quiet on the theory group's floor that I could hear echoes from my pen scratching. Suddenly, the public address system crackled to life; and our branch secretary announced in static-laced tones that today, October 3, was my birthday. I snickered a bit to myself, phoned the secretary, and pointed out that she was looking at the wrong slot on my personnel form; my birthday was in April. After hanging up the phone, I thought to myself that October 3, 1960 was a kind of birthday: it was the day I began work as a research physicist at Aberdeen Proving Ground, Maryland.

My career in physics was an accident, an unplanned trek over uncertain terrain. My first love as a student at Fort Hays State University (FHSU) was mathematics, not physics. I still treasure math. In the last sixty years, no doubt, I've forgotten much of the math nitty-gritty I learned at FHSU. But I still remember the teachers that introduced me to the subject with a rosy, fond gratitude:



Left to Right:  
Mr. Marshall, Mr. Toalson, and Mr. Etter

**Mr. Etter** standing at the blackboard with the sunlight glinting off his glasses, hiding his eyes, which no doubt twinkled with amusement, as he cast out nines to check a calculation. Who knew then what casting out nines meant?

**Mr. Marshall**, his face crossed with a broad smile, trundling into class with our homework or exam papers squeezed against his body with his infirm arm—those papers, always folded lengthwise, flopping about as he walked.

**Mr. Toalson** popping into the classroom, sweeping up all the small bits of chalk from the blackboard tray, throwing up the window, and launching the bits into the void. He was also the maestro of the dreaded pop-quiz.

I declared my math major at the end of my sophomore year. The physics major came later. At FHSU my interests in science shifted from my high school fascination with chemistry to physics, which I saw as applying the math I was learning to the “real world.” As the physics credits began to accumulate, the chance of eking out a second major in physics dawned on me; and possibly as late as my first semester as a senior, I went to the registrar's office and hand-carried the forms required to declare a physics major to the department chair, Professor D. K. Brooks, for his signature.

After graduating in May 1960, I was admitted to graduate study at the University of Kansas. I'd cut costs during my years at FHSU by living with my grandparents; but living on my own in Lawrence would make money a big issue. After a confab with my family, the decision was “get a job.” Job hunting in math and physics began in earnest: applications were filed, interviews attended, and pre-employment tests were taken. At some point I went to the post office in Salina, copied information from the bulletin board about Civil Service positions in math and physics, and mailed off applications. And then, nothing. As the summer dragged into August, no offers came. Worry set in, but I used the time to dabble in books such as *Space, Time and Gravitation*<sup>2</sup>, and *Fourier Series and Boundary Value Problems*<sup>3</sup>.

The first job offer was in physics and came from Aberdeen Proving Ground. I said yes, even though it wasn't the math job I wanted and felt more qualified for. More offers came later; but I'd given my word; and with an abundance of youthful naivete, I believed I should stick with it. Professor Toalson was my academic adviser; and during my last session with him he urged me to consider teaching, for which I could muster no interest. Mr. Toalson added that otherwise what I could expect would be some kind of "government job." As things turned out, it was a prescient remark.

My security clearance came through on time; and after a nearly three-day car trip, I arrived in Maryland ready for my first day on the job. I remember the day well: being sworn in, meeting my section chief and co-workers, and locking the keys in my car.

Soon I was busy in the lab making measurements of thermodynamic properties with techniques such as thermogravimetric analysis and differential thermal analysis. It's likely that I'd drawn this assignment because I'd done well in the thermodynamics course at FHSU. (I was much better at the theory of thermodynamics than I was in the thermo lab, where my lab partner and I had managed to demolish a major piece of equipment.) On the job I got some valuable experience in bench level physics. Gradually, over a period of several years, I moved away from bench work to modeling thermodynamic properties and processes.

Johns Hopkins University in Baltimore offered evening courses in physics leading to a master's degree. I signed on and was soon commuting three, sometimes four nights a week to physics and math classes. Nighttime physics classes were taught by full-time faculty, which was a plus. I had some outstanding physics teachers at Hopkins: Franco Rasetti, optics and quantum mechanics; Aihud Pevsner, advanced mechanics; and J. A. Bearden, advanced laboratory. The curriculum was a long slog — course work, a language exam, a full academic year of advanced laboratory work, and an essay describing a small bit of original research — but I finished in 1971.

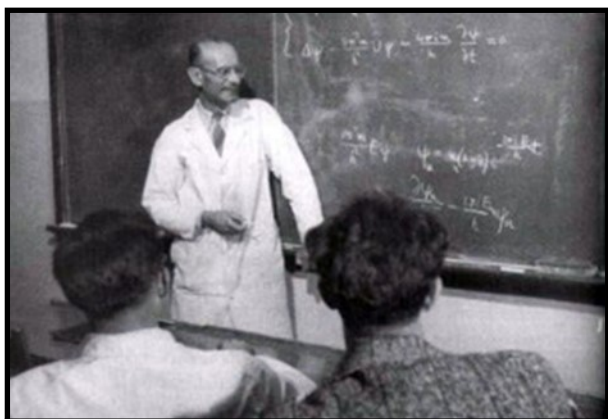
Although the essay research, influenced greatly by J. A. Bearden's advanced laboratory course, was a reversion to experimental work, the 1970s marked a turn to more theoretical research in aerosol spectroscopy, optical properties of materials, light scattering calculations, and infrared lidar techniques. With variations, these were the themes that characterized my research until retirement. Much of this work was done in collaboration with university physicists both in the U.S. and other nations.

After the long slog at Hopkins, I waffled for years about pursuing a doctorate. As I approached age 50, I was again bitten by the academic bug, applied to the University of Maryland, College Park, and was admitted. At that time, I had nearly thirty years of professional experience and felt confident that if I could get through the class work, I would have little trouble completing the required research and a dissertation. But I was (am) an erratic student, doing well if I can maintain my interest and not so well when it's lacking or wanes. As it turned out, I managed to pass my courses in good shape.

After a few years of dealing with the grind of a long commute, cramming study into an already crowded job schedule, and dealing with demanding family obligations, I was ready to go full-time and complete the required year "in residence." But, repeated efforts to negotiate a full-time academic effort with my employer failed, quite a disappointing outcome.



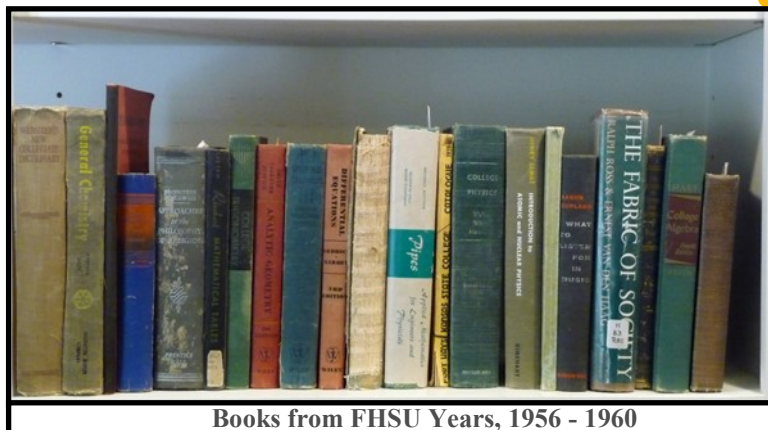
In the Lab, circa 1961



Franco Rasetti Lecturing on Quantum Mechanics  
Photograph by Paul Koenig, courtesy of AIP Emilio Segrè Visual Archives, Rene Bureau Collection



I retired from my full-time position in 2003 and formed a one-person consulting business; soon I was back working part-time. Full retirement came seven years later in 2010 after a half-century of experience as a research physicist. It was a long journey, and FHSU was, and remains, with me: on my bookshelf are 21 of my undergraduate textbooks: mathematics (7), physics (2), and chemistry (1) among them. I am now rereading the little book<sup>4</sup> that Mr. Toalson assigned for his course on matrices (Math. 130).



Books from FHSU Years, 1956 - 1960

Full retirement brought a move to a retirement community in Maine. So far, it's been an active retirement. I'm the president and treasurer of a small non-profit (Gateway Seniors Without Walls) and a board member and treasurer of our homeowner's cooperative (Dirigo Pines Homeowners Corporation). I'm also active in our local book group and audit courses at the nearby campus of the University of Maine (without charge for old, retired Mainers). Nearby hiking trails are great for getting in my  $10^4$  daily steps. Classical music and opera are still a treat even for old, less than acute ears. For distraction I make various stabs at fiction writing: I've produced a fairly large collection of short stories, and I have a first novel in the planning stage.

I no longer do any serious physics. But I do dabble a bit: keep in touch with old colleagues, read "Physics Today," "American Scientist," and "Scientific American;" keep emeritus memberships in the American Physical Society, The Optical Society of America, and Sigma Xi: The Scientific Research Society; and scribble a few equations when the spirit moves me (not often).

Albert Einstein once cautioned a young physics student that, "... the study of physics ... is a difficult matter if one is not going to be satisfied with superficial results<sup>5</sup>." But what's judged superficial? Achievement in physics on the level of an Einstein is a rarity, not to be expected in the life of most physicists. I take some comfort in recognizing my strengths and weaknesses as a physicist, sure in the knowledge that I did what I could and that it was not without some merit. Einstein also wrote, "The scientific theorist is not to be envied. For Nature, or more precisely experiment, is an inexorable and not very friendly judge of his work."<sup>5</sup> True, but the satisfaction that comes when what one has calculated agrees with experiment is sublime. In a small way, some aspect of Nature has been internalized, understood, and made explicit through "the magic of mathematics."

When I reflect on my 50 years in physics research, the words of physicist Steven Weinberg often come to mind, "Men and women are not content ... to confine their thoughts to the daily affairs of life; they also build telescopes and satellites and accelerators and sit at their desks for endless hours working out the meaning of the data they gather. The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce and gives it some of the grace of tragedy."<sup>6</sup> Physics isn't the only approach to understanding the universe, nor is it for everyone, but it was the way for me. My life in physics wasn't without its difficulties and struggles, but it also gave me certain unique and lingering satisfactions. This old student is very grateful to my Alma Mater, FHSU, for making it all possible.

<sup>1</sup>Fort Hays Kansas State College when I attended, 1956 – 1960

<sup>2</sup>Eddington, Arthur Stanley, *Space, Time and Gravitation*, (Cambridge University Press, Cambridge, England, 1941).

<sup>3</sup>Churchill, R. V., *Fourier Series and Boundary Value Problems* (McGraw Hill, New York, 1941).

<sup>4</sup>Wade, Thomas L., *The Algebra of Vectors and Matrices* (Addison-Wesley, Reading, MA, 1958).

<sup>5</sup>Einstein, Albert, *Albert Einstein: The Human Side*, eds. Dukas, Helen and Hoffmann, Banesh (Princeton University Press, Princeton, NJ, 1979): 18, 55.

<sup>6</sup>Weinberg, Steven, *The First Three Minutes: A Modern View of the Origin of the Universe* (Basic Books, Inc., New York, 1977): 154-155.

# FHSU Students Present and Compete at KsMAA



Ashley Pritchard, Wichita KAMS student will be attending Kansas State University in the fall to pursue her Mathematics Degree.

FHSU Mathematics faculty and students made the long trek to Pittsburg Kansas for the 104th Annual Kansas Section Meeting of the Mathematics Association of America. On Saturday March 30, the faculty attended sessions presented from faculty around the region. Drs. Keith Dreiling, Thomas Dunn, Sarbari Mitra and Hongbiao Zeng each presented their research at the conference. Concurrently with the morning presentations, FHSU students Tyler Bloom, Lailah Collins, Fernando Guzman, Ashley Pritchard, and Sheena Zeng competed in the Problem Solving Competition.

After a delicious Italian Lunch and an interesting presentation by Dr. Curtis Cooper, University of Central Missouri, on Mersenne Primes everyone attended the student presentations. Tyler Bloom ('19) presented his research on The Devil's Chessboard. Tyler had studied this problem with his peers, presented his seminar on this topic, and refined his research with Dr. Sarbari Mitra. Finally, Ashley Pritchard (KAMS '20), under the tutelage of Dr. Sarbari Mitra, presented her undergraduate research project on Fibonacci Cordial Labeling of Comb Graphs. After safely returning back to Hays, all



Tyler Bloom, (left) is seen here speaking with Dr. Curtis Cooper at the KsMAA Conference. Tyler graduated with degrees in Math and Physics in Spring 2019. In the fall, Tyler will be attending graduate school in Vermont.



Mr Millham visited the Fort Hays State University Campus during the 2019 Summer. It was an honor to meet him.

Bev Unruh.....Merill Mihlam, Lanee Young.

## On The Road Again by Thomas Broxterman

As a graduate of Fort Hays in December of 2017 and being from Eastern Kansas I am very familiar with the trek from Topeka to Hays. But when I found out that FHSU was offering a Masters in Education (Mathematics) and my school district Royal Valley had a tuition reimbursement program with a bonus if you completed a program in your area of study, I figured I couldn't pass up! This is a program that is not offered at many places, especially not at the affordable price of FHSU. So, with intentions of teaching College Algebra I decided to begin in the summer of 2018. By the end of my time in the program this summer I will have made the trek across the state from Hoyt to Hays 24 times to spend 240 hours learning upper level math in Rarick Hall. That's 10,176 miles, 8,160 minutes worth of Dave Ramsey podcasts, and over 100 cups of coffee to get me through the Flint Hills and strong Western Kansas breezes along I-70.

The first thing I want to discuss are the classes. Some people, well almost anyone, think that I am crazy for spending my summers off taking math classes. I definitely questioned myself and what I got myself into my first summer taking Complex Numbers with Dr. Riazi! However, my mindset on school and education has changed since high school. I have taken a different approach to how I take classes. I now view them as an opportunity to learn something new and am more focused on challenging myself and working to figure things out through that productive struggle. Our focus should be less on the grades and more on developing an understanding for the beauty of math and just growing as a mathematician. I will admit, the classes have definitely challenged myself and my classmates but that should happen when taking higher level courses. I always look forward to coming to class with our wonderful professors, as I always prefer the classroom over online courses. The classes I have taken online have been very flexible with my busy schedules as a teacher and have the right amount of coursework to keep me challenged, yet also not consuming too much of my time. My favorite class has been the teaching methods of mathematics. It has challenged me to try new things in my classroom and also given me the ability to collaborate and discuss ideas with other math teachers.

Lastly, you can't have a class without the professor and the students. The people I have encountered and the connections I have made on this journey through the program has been amazing. We have the best professors in the state who genuinely care about our success as teachers, even after we leave Hays. Last summer we had a cookout with the professors and students in the program and that was my favorite experience of the summer. It was awesome to see everyone get together and just have fun and enjoy good conversation about funny stories and things we've encountered throughout teaching. I have learned a lot from the people I have met through this program.

There is no way I would be where I am today without the amazing people I have encountered through my time as an undergraduate student and as a graduate student. There is no substitute for the genuine relationships and opportunities that FHSU has provided myself and others who have gone through the math department. The only thing I won't be sad about when I am done this summer is the 3 story climb to the 3rd floor of Rarick! Thanks to all the amazing people who have helped me along this journey.



**Check out our Master of Science in Education with an Emphasis in Mathematics at the following link:**  
[www.fhsu.edu/macs/academic-programs](http://www.fhsu.edu/macs/academic-programs)



# Remember Patrick Cook from Last Year's Newsletter?



This is what Patrick will be doing this summer....what will you be doing?

Patrick accepted an internship at Lawrence Livermore National Laboratory (LLNL) specifically a High Energy Density Physics internship with the Weapons and Complex Integration Directorate. After his summer internship, Patrick will attend Michigan State University to pursue his PhD in Math and Physics.

LLNL's [Weapons and Complex Integration \(WCI\) Directorate](#) works to ensure the remaining deterrent remains safe, secure and reliable. WCI accomplishes this through the Stockpile Stewardship Program — an ongoing effort to apply a science-based fundamental understanding of nuclear weapons performance — from the development of enhanced warhead surveillance tools that detect the onset of problems to manufacturing capabilities that produce critical components.

## SUMMER MATH CLASSES

### On-line

MATH 010 — Intermediate Algebra  
MATH 110 — College Algebra  
MATH 122 — Plane Trigonometry  
MATH 250 — Elements of Statistics  
MATH 331 — Calculus Methods

### On-Campus

MATH 671 — Theory of Numbers  
MATH 881 — Geometry and Measurement

## Putnam Results

This past December, the 80<sup>th</sup> annual William Lowell Putnam Mathematical Competition was held. This is an advanced math competition for undergraduates. It consists of two 3 hour sessions with 6 problems each. There were a total of 4229 students who participated in the competition. Historically, the median score has been 0. This year we had two students participate: Tyler Bloom and Fernando Guzman. Tyler Bloom got 10 points, which puts him in the 76<sup>th</sup> percentile. Fernando Guzman got 3 points, which puts him in the 59<sup>th</sup> percentile.

There were 488 schools that participated. The teams score is found by adding the highest three scores of the students. Even though we had only 2 students participate, we ranked 238<sup>th</sup>.

## Dr. Zeng hosts Math, Code, Magic Summer Camp

Dr. Hong Biao Zeng will host Math, Code, & Magic, a computer programming summer camp sponsored by Kansas Academy of Math and Science, between June 8 and June 11. This is the sixth consecutive year that Dr. Zeng has hosted such a summer camp. During this year's camp, up to 20 high school freshmen and sophomore students of Kansas will learn how to use Java to implement a Graphic User Interface (GUI) to demonstrate couple card tricks that have math reasons behind them. In the past five years, campers learned Java, Alice, Scratch, and Unity Game Engine. Please visit the website <https://www.fhsu.edu/kams/summer-camps/index> for more details. Please notice that on the website, the camp time starts June 7 as students must check into the dorm on June 7 so that the camp can start on June 8. \*\*\* Please check to see if this is happening due to Covid-19\*\*\*\*

# New Faculty – Anas Hourani



My name is Anas Hourani. I joined FHSU on Jan 2019 as an adjunct faculty member in the Computer Science Department, then I was fortunate to get an offer of Assistant Professor, which I didn't hesitate to accept since it's a great opportunity to be part of such an active and distinctive department, which has a professional and friendly environment. I'm originally from Jordan, I was born and raised in Al-Karak, one of the historical cities in Jordan, located in the south region. I'm really in love with this city. Now every time I go to Al-Karak, it takes me back to all beautiful memories from my childhood. Al-Karak has a large historical castle (one of the three largest castles in the region); also, the Dead Sea is in there which is the deepest point in the world.

When I was a child, I had a huge passion for problem solving and logical thinking, and this passion led me to major in computer science. Computer technology is part of everything we do, it is part of the cars we drive, movies we watch, and businesses we interact with. It makes a positive difference in the world. Therefore, I went to Al-Balqa Applied University to study Information Technology and graduated in 2004 with Bachelor of Science degree. A few months later, I went to the school again to deepen my knowledge in Computer Science, and graduated in 2006 from Al-Balqa Applied University

with high diploma degree in Computer Science (two years - equivalent to non-thesis master of science). In 2012, I got my Maser degree from Amman Arab University with Master of Science in Computer Science, and I received M.S. Honor Degree, where I have been ranked the first among all graduate students in the Computer Science Department. In the same year (2012) in August, I moved to New York, USA in order to pursue my graduate study, and graduated in 2015 from the State University of New York at Binghamton with Ph.D. degree in System Science.

In 2013, I got married to an amazing wife, Shayma, and we have two adorable children, Zaina (5 years), and Sanad (3 years). I'm really very grateful for my wife since she always takes care of everyone in the house. My children and myself are truly lucky of having Shayma in our life.

No one comes in this world at the stage where I am right now, without the support of family and friends. In fact, what I am today, is because of my family. My father is a reputable man in our community. My mother is a teacher. They both love their profession. I have learned from them the value of time, sincerity, hard work and dedication to the purpose.

I consider teaching a very important and enjoyable academic duty. While there are many reasons why teaching is important, the most compelling one is that it is one of the most effective ways to pass on our knowledge, thus ensuring that our field grows and prospers. Besides that, I also enjoy research, because research provides a unique opportunity to solve problems and envision the technology of the future. My current research interests are concerned with the development of methods and algorithms for data mining, machine learning, analytics, and big data.

I am rarely free from my routine works, but whenever I am free, I love playing Ping pong with my friends. I have a little interest in watching movies. Most of all, I love to value my time for the good of my future.

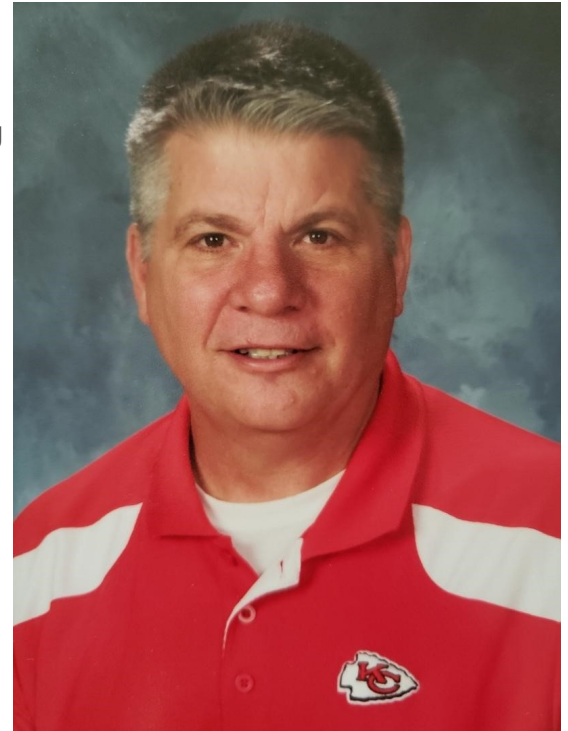
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# Masters of Science in Education with an Emphasis on Mathematics Program

by Lyle Thompson

Roughly three years ago, I accepted a teaching position in Fairbury, Nebraska after “retiring” from a 30 year teaching career in Kansas. Part of the requirement for my new teaching position included pursuing a Masters Degree so I would be qualified to teach dual college credit courses through the local junior college. At the time, I had exactly zero hours towards a masters of any sorts. I set out to find a program that would meet the qualifications for Southeast Community College, and chose a couple of schools that were close to where I lived. However, both of those programs were denied by Southeast. Since I am a Fort Hays State University alum, I decided to check the grad programs on the online website, and I could not find anything. So I made a phone call to the Math Department, and it just so happened that Dr. Dreiling and Dr. Young were in the process of putting a program together that not only met my needs, but satisfied the requirements set forth by Southeast.



The program consists of 33 to 34 hours of class time. Eighteen of those hours are taken within the math department and offered in the summer session only. There are two classes each summer taught on 8 consecutive Mondays and Tuesdays in June and July. Classes ran from 9 AM to 4 PM on Monday, and from 8 AM to 3 PM on Tuesday with an hour for lunch. The staff was very accomodating on the times, as several of us who were in the program had 3-4 hour commutes. The two classes each summer were split into one class of theory and one class of content. The first summer the classes were Advanced Calculus (4 hours) and Concepts of Algebra (3 hours). The second summer the classes were Functions of a Complex Variable (3) and Concepts of Calculus (3). This past summer the classes were Graph Theory and Concepts of Probability and Statistics. Those were also 3 hour courses for a total of 19 hours over the three summers.

This new program was also ideal for teachers who already had their masters in something else, but needed the 18 hours of math required by colleges now to be able to teach at the college level.

For students like me who needed to complete the entire masters degree, the remaining 15 hours of the program were through the Education Department with one optional class, Teaching Techniques, that you can take either through the Education Department or the Mathematics Department. This includes Utilization of Technology in the Classroom, Educational Research, Data Analysis and Assessment, Culture Diversity, and the Teaching Techniques course previously mentioned. Several of these courses also meet the requirements of an administration degree if that degree is in your future plans. All of these courses are offered online, and most can be taken in either the fall or spring semesters. Nearly all of these classes can be taken in an 8 week or 16 week format, so it is fairly easy to set up a class schedule that also fits into your regular high school day routine.

For those of you out there looking for a program to do something along these lines, this is an outstanding program. The staff in both the Mathematics Department and the Education Department are top notch and will do anything they can to help you along your journey, so we, as teachers, can continue to do what we do, educating the young men and women of the next generation.

# 2019 Faculty Scholarly Activities

Faculty from the Department of Mathematics and the Department of Computer Science are actively involved in scholarly research. Faculty worked with 20 KAMS students and one undergraduate student on research projects, conducted weekly problem solving session with students, served as seminar advisors for fifteen students, served as presentation advisors for three students who presented at KsMAA, and presented weekly seminars. The following is a list of scholarly activities by mathematics and computer science faculty in 2019.

## Weekly seminars

**Mathematics Stack Exchange Communications**

**Factorization**

**Fibonacci Cordial Labeling of Some Special Families of Graphs**

**Solving Cubics and Quartics**

**Productive Struggle: Problem Based Learning in the Classroom**

**Function Language and Math Problems**

**Proof by Consistency: The Inductionless Induction**

**Teaching in China**

**Leaping Through the Orbits**

**Ramsey Theory**

**Hilbert's New Hotel**

**The Return of Kaprekar**

**Math, Code, and Magic**



## Presentations

**Fibonacci Cordial Labeling of Some Special Graphs**, MAA Mathfest in Cincinnati, OH

**Kaprekar's Constant**, 2019 Area Math & Science Teacher Workshop in Liberal

**Problem Based Teaching**, Tiger Nation Inservice

**Mathematical Modes of Inquiry**, Presentation for Department of Philosophy

**Kaprekar's Constant**, KsMAA in Pittsburg

**Channel Assignment Problem of Circulant**, KsMAA in Pittsburg

**Functional Programming and Math Problems**, KsMAA in Pittsburg

## Faculty works that were accepted for publication

**Teaching Science and Technology**, *Scholars Journal of Engineering and Technology*.

**L(2,1) Labeling of Circulant Graphs**, *Discussiones Mathematicae Graph Theory*

**Graceful Labeling of Triangular Extension of Complete Bipartite Graph**, *Electronic Journal of Graph Theory and Applications*

## Other Notable Achievements

A faculty member has earned over 62,000 reputation points with almost 4000 answers and 25 proposed questions in the Mathematics Stack Exchange.

A faculty member solved four problems in the Mathematical Olympiads group in LinkedIn.



Faculty and Students attended the KsMAA Conference in Pittsburg, KS on March 29-30 2019.

Back Row: Fernando Guzman, Ashley Pritchard, Tyler Bloom, Keith Dreiling, Bader Abukhodair, Hong Biao Zeng.

Front Row: Soumya Bhoumik, Sarbari Mitra, Ilora Bhoumik, Lanee Young, Lailah Collins, Sheena Zeng.



# MATH RELAYS 2019

by Bill Weber

Another successful Math Relays is in the books, as the FHSU Math & Computer Science Departments hosted the 41<sup>st</sup> Annual Math Relays on November 14, 2019. We were able to host nearly 600 students from 44 schools on that day!

In class 1A, the team champions were once again St. John's Catholic, followed by Tipton Catholic in 2<sup>nd</sup>, and Osborne 3<sup>rd</sup>. In the 2A/3A category, TMP-Marian won top honors, with Ellsworth 2<sup>nd</sup> and Republic County and Minneapolis both finishing 3<sup>rd</sup>. Within the 4A-6A category, Hays High brought home top honors, with Maize South 2<sup>nd</sup>, and McPherson 3<sup>rd</sup>. For a complete listing of team placing and individual winners, please check our website <http://www.fhsu.edu/macs/Math-Relays/Past-Winners/>

In addition to the competition, we also had FHSU math faculty available to visit with students about what it means to be a math major at FHSU, as well as games to play and puzzles to solve for students during their non-testing times. We visited with a large number of students; hopefully this will entice some of them to consider a degree in math from FHSU! Our alumni can be a great source of recruiting also, so if you know of a student in your local community who might be a good math major, please have them contact me at [bweber@fhsu.edu](mailto:bweber@fhsu.edu)

## MATH & CS Faculty Assist with Science Olympiad

The 2020 Regional Science Olympiad was held on the campus of Fort Hays State University on February 19 and February 21. Over 300 students from fifteen different schools competed in a variety of events covering topics subjects such as the nature of biology, earth science, chemistry, physics, computers, astronomy, engineering, and technology. If you have never been to a Science Olympiad, you should stop by next year and see the students creativity and excitement during an academic competition. Seeing middle school students running around in lab coats and goggles will brighten any day.

The Departments of Mathematics and Computer Science at Fort Hays State University have been actively involved in coordinating, organizing, and judging events for the past several years. Faculty members who assisted with the 2020 FHSU Regional Competition: Lanee Young – Coordinator, Tom Dunn – Mission Possible, Judy Brummer – Designer Genes, Michelle Zeng – Heredity, Jeff Sadler – Mousetrap Vehicle, Soumya Bhoumik and Sarbari Mitra – Write It Do It and Codebusters, Bader Abukhodair – Machines, and Anas Hourani – Game On. Keith Dreiling and Bill Weber covered Lanee's classes and Dr. Riazi continued to solve problems throughout both days.



## Celebrating 80 years

In December 2019, Beverly Unruh, Mathematics Department and Computer Science, celebrated 40 years at Fort Hays State University. Thanks to Dr. Beougher for hiring Bev!!!!

Keith Dreiling ('83, '90) and Lanee Young ('95, '96, '01) also celebrated 20 years at Fort Hays State University. Thanks to Dr. Sandstrom for taking a leap and "growing our own."



# Check out this article from a Math Department Newsletter from the early 1980's.....some things don't change.

## TEACHER SHORTAGE IN MATHEMATICS

By: Jeff Barnett

The growing shortage of qualified mathematics and science teachers in the U.S. has been a topic of much concern over the past decade. This shortage has been particularly acute in rural states such as Kansas, which have a low salary base. In recent years, the total number of secondary mathematics teachers that have graduated from Kansas colleges and universities has often been less than 15 per year, while the number of job openings at the secondary level has been many times that amount.

To document this shortage, a survey of 413 Kansas school districts was conducted by Dr. Jeff Barnett of the FHSU Mathematics Department in 1982. The survey was designed to determine the extent of difficulty that secondary superintendents had with filling mathematics positions with certified mathematics teachers. The survey was returned by 199 of the 413 school districts polled (48%). About 13% of these districts were not able to fill their mathematics vacancies with certified secondary mathematics teachers. Of these, 29% hired temporary substitutes, 46% hired elementary teacher to teach secondary mathematics, 17% eliminated the position by enlarging class sizes and cutting course offerings, and 63% hired or reassigned certified teachers in other areas than mathematics to teach mathematics courses. Of the 87% that were able to fill their positions, 63% reported extreme difficulty in finding qualified teachers.

The results of the survey show that the secondary mathematics teacher shortage in Kansas is serious, and seems to be getting worse. Significantly, 54% of the responding superintendents were not contacted by a single applicant,

## Teacher Shortage Continued...

but had to recruit applicants by contacting them through college placement offices, in and out of state.

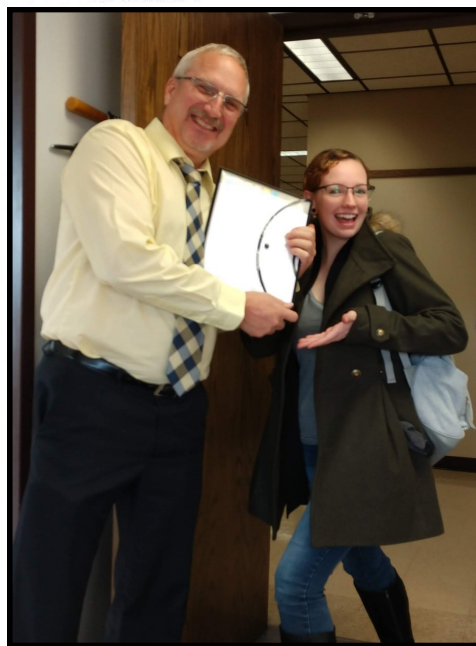
The comments made by some of the superintendents were particularly revealing. In many cases, superintendents believed that if members of their mathematics faculty leave the district, they would not be able to replace them. Even in districts which have been able to fill their positions with certified teachers, superintendents expressed the concern over the lack of choice among applicants. Some selected superintendent comments follow:

"This year I had to go to Michigan to hire a math teacher."

"We looked for a math teacher in four states before finding one that just returned from \_\_\_\_\_ ten days before the start of the school term."

"In order to hire certified math teachers the last two occasions, I was forced to hire two husband-wife teacher (combo.) to get the math teacher."

"In 1981-82 we had no applicants from Kansas and hired out-of-state."



You remember that happy feeling when you turn your project in for MATH 381 or even better...you finish your seminar paper!

Dr. Dreiling and Kelsie Whitcomb are happy with the finished product.

## FHSU Math Education Majors Continue to Receive Benefits through NSF Noyce Program

Both pre-service and in-service math education majors at FHSU continued to see the benefits of the NSF Robert Noyce Scholarship Program during the 2019-2020 academic year. Seth Boxberger (Russell junior via K-State), Judson Tillotson (Valley Center junior), Alexis Meinart (Garden City senior via Garden City CC, Diana Sabados (Brighton, CO senior), Nicholas Schmidt (Hays senior), and Lauren Zerr (Russell Springs senior) received scholarships for nearly \$14,000 each as they complete their degrees at FHSU either this spring or next year. Additional benefits (besides the scholarship itself) included paid travel to math/science conferences, coursework which directly prepares students to teach in rural school environments, and specialized mentoring both while at FHSU and after graduation, so that each graduate of the program is optimally prepared to enter teaching as well as continue in it for years to come.

As an example of the leadership skills we focus on in the Noyce program, former awardee Thomas Broxterman (currently teaching at Hoyt-Royal Valley High School) was recently selected to be a member of the 2020 cohort of the 100Kin10 Teacher Forum. Thomas was 1 of only 74 teachers selected from across the country, and I believe state University the only Kansas teacher selected. A quote from the forum stated “These teachers stood out for their leadership in and commitment to advancing STEM teaching, passion for raising up the voices and experiences of their peers, and belief in and desire to contribute to 100Kin10’s mission to address the STEM teacher shortage.” Congratulations Thomas!

We are currently wrapping up year 2 of a 5 year Noyce cycle, so if you know of any students who you think might make great math or science teachers, please give them my contact information at [bweber@fhsu.edu](mailto:bweber@fhsu.edu) ; I’d love to visit with them about the program! We have 3 years remaining in which to award scholarships, and in order to be eligible for the grant, students must be at least of junior status, meaning they must have completed at least 60 credit hours of coursework. Other requirements include a minimum GPA, active participation within the local STEM education group, and a commitment to teach math/science for 2 years after graduation. Specifics can be found at <https://www.fhsu.edu/smei/noyce/>. As a summary, during the previous 8 years of awarding Noyce scholarships, 35 math education majors were awarded scholarships (some for 2 years and some for 1 year) totaling nearly \$437,000 through the NSF Noyce Program. Of all the math education majors who have been supported through this grant, 14 of them are currently teaching, 3 are student teaching, and 3 are current students finishing their coursework. What I believe is most impressive, though, is that ALL of our math Noyce awardees are still teaching, even if they have completed the service requirement from the grant! They truly are the next generation of math Teacher-Leaders, and their students will most certainly benefit from their dedication and expertise in teaching mathematics!



Remember Perla — She presented with Dr. Paul Adams and Dr. Janet Stramel at the Noyce Summit in 2019 in Washington D.C.

## New Adjunct/Sias Faculty in Math and Computer Science

More faculty were hired to handle the growth of the online Computer Science Program, the start of a new cohort of students in the Computer Science Program at Sias, and the increase of students in general education Mathematics courses.

**Jayme Goetz** taught a section of MATH 110 College Algebra in the fall and this spring. Jayme earned the Masters of Science in Education and an MSE—Mathematics from FHSU. She teaches mathematics at Hays High.

**Elaina Garrett** is teaching a section of MATH 010 Intermediate Algebra. She earned a BS in Mathematics from FHSU and is working on her MSE —Mathematics from FHSU. Elaina teaches middle/high school mathematics in Oxford, KS.

**Meagan Feril** finished her MSE with Emphasis in Mathematics from FHSU in the summer, taught a section of MATH 250 Elements of Statistics in the fall and again this spring. She teaches high school mathematics in St. John, KS.

**Andrei Domagas** currently teaches two sections of CSCI 231 Object-Oriented Programming. He earned his M.S. in Cyber Security Ops & Leadership from the University of San Diego. Andrei teaches at Cuyamaca Community College in CA.

**Piotr Windyga** is teaching CSCI 331 Operating Systems for Sias University this spring. Because of the coronavirus, classes will not meet on campus and only be offered in an online format, so Piotr will teach his courses from the U.S. Piotr holds a Ph.D. from University of Rennes I in France.



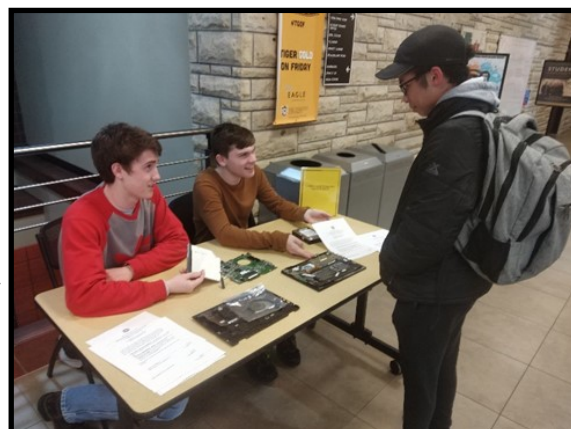
# Coder & Programmer United Club (CPU)

Coders and Programmers United (CPU) is a student organization for computer science students. In the past, CPU served to provide challenges for students looking to further expand their programming skills. Under the leadership of President Keegan Chapman and Advisors Dr. Anas Hourani and Dr. Hongbiao Zeng, CPU's focus has shifted to serve an ancillary role to the curriculum, as well as a gateway into the field for the general public.



Rounding out the executive team are Vice President Trevor Fisher, Treasurer Gregory McClurg, and Assistant Treasurer Nicholas Zimmerman. Under the new constitution, these executives lead the organization with Project Leads and Committee Chairs nominated to oversee specific events. Every two weeks, CPU hosts general meetings open to the public, with executive meetings on the off weeks.

As part of its new mission, CPU offers workshops, study resources, and professional development resources. Topics ranging from programming techniques, theory, and application, to hardware purchasing, job scouting, and self-promotion will be available in CPU's activities. Workshops are offered on a bimonthly basis, in which students may receive certifications. Resources are being compiled for a website to offer help with code reference and technique, computational theories, and developments in the field. A group chatroom using Discord is also offered, for hands on assistance. In the future, participation in campaigns and conferences are planned.



## Retired Faculty News

**Editors Note: Thank you to Dr. Votaw and Mrs. Schippers for your contribution**

Charles Votaw

I am pleased to report that I got to see most of the department personnel at the service award ceremony and you all seem to be doing well. Another significant event, from my point of view, was a trip to Manhattan to attend a great-granddaughter's wedding. While that may not be all I did this past year, it's all I'm reporting. I hope everyone has enjoyed the past year and gets even more joy from the coming year.

Mary Kay Schippers

I am still loving retirement! But I am also still busy as ever - just with projects other than teaching.

Our farm keeps me very busy especially in spring, summer and fall. In winter, I tend to work on inside projects like painting, sewing, and writing. I made multiple trips to both Rapid City and Phoenix last year to see the kids and grandkids, sometimes alone, sometimes with Danny. In addition, we visited the state of Michigan for the first time. We set a goal for ourselves to visit every state in the union at least once, but we still have 19 left. Wish us luck! Till next year....





Stay tuned for a VIRTUAL PIZZA DAY coming soon!!!!!!!!!!!!!!

## Thank You for Your Support

Department of Mathematics enjoys this opportunity each year to list the donors who have given so generously to our department. Without your contributions it would not be possible for us to award scholarships to our deserving majors. Please check out the list of students receiving scholarships. We wish to thank each of you who have shared your financial resources with the university, and especially wish to thank those of you who have designated the Mathematics Department as recipient. We also appreciate the employers who matched your contributions.

Charles and Cathryn Allphin, Allphin Family Living Trust #2, Lavern and Cari Andrews, Patrick and Keri Applequist, Connie Ausland, Gary and Bernice Bell, Wendy Beougher, Charles and Charlotte Bigler, Duane Blaesi, Rex and Beverly Blanding, Sonny and Theresa Blyn, The Boeing Company, Jerry and Edith Bollig, Susan Bozeman, Darren Brungardt, Ron and Bernice Capps, Neil and Sharon Carlson, Robert and Nancy Chaffin, Craig and Anita Curtis, Thomas and Emily Decker, Ronald and Angela DeVore, Keith and Pam Dreiling, Anderson and Camia Dugazon, Kay and Mildred Dundas, Dennis and Diana Echard Thomas Edgett, Dan and Martha Eining, LeAnn Eltze, William and Debra Fox, Leslie and Karen Freeman, Jerold and Paulla Harris, Delores Healey, Al and Marilyn Herren, Rodney and Karen Hunley, Roger and Teresa James, John and Regina Johnson, Justin and Amy Johnson, Cheryl Kessler, Mike and Carmen LaBarge, Darrell and Sheila Latham, Larry and Donna Leitner, Aaron Lessor, Dee Lessor, Thomas Lonnon, Paul and Pat Luea, Jim and Shirley Malcolm, Larry and Connie Masters, Maria and Perry Mick, Jean Milham, Merrill Milham and Ann Davidoff, Ronald and Debbie Miller, Regina Miller, Mutual of Omaha, Mutual of Omaha Foundation Wayne and Alberta Neel, Sylvia Nelson, Weeden and Rosalie Nichols, Curtis and Karen Pahls, Geoffrey Peter, William Peterson, Donald and Kathy Petr, James and Sharla Pfeifer, Larry and Darlene Plymell, The Prudential Foundation, Mohammad and Seddigheh Riazi-Kermani, Jeff and Lori Sadler, Ron and Cathy Sandstrom, Sharon Schlegel, Kimberly Schmidtberger, Gail Stanley, Jim and Debbie Stelter, David and Betty Taylor, Textron, Inc, K & L Trimmer Foundation, Blake and Crystal Vacura, Ellen Veed, Charles and Reta Votaw, Bill and Tiffany Weber, Rex and Margaret Wilson, Marilyn Wilson, Leroy and Sharon Winklepleck, Lori Wittrock, Rick and Martha Zakrzewski, Hong Biao and Michelle Zeng

Sianna Miller (Goodland) and Judson Tillotson (Valley Center) received a renewable scholarship from Mike and Peggy Moore. Sianna and Judson are studying Mathematics Education. Thank you Mr. & Mrs. Moore for your support of the Fort Hays Mathematics Department and our students!



# 2019-2020 Scholarship News

Jeff Sadler

The Mathematics Department continues to award substantial financial scholarship funds to many pursuing a mathematics degree at FHSU primarily due to continued support of alumni gifts. Funds donated by friends of the Mathematics Department as well as other sources provided just over \$120,000 in awarded student scholarships during this past year. The scholarship dollars significantly reduced the cost of a higher education for the awarded forty-six students.

The Noyce Scholarship Program (co-directed by the Mathematics Department's Dr. Bill Weber), and the SEMI-Steffen Scholarships (directed by Dr. Paul Adams through the FHSU Science and Mathematics Education Institute) continue to provide significant scholarships for many mathematics majors. Due to a five-year renewal of the Noyce Scholarship program in 2018, the following students received approximately \$81,000 in scholarships dollars during the 2019-2020:

Alexis Meinert (Garden City)—\$13,500 Noyce Scholarship  
Nicholas Schmidt (Hays)—\$13,500 Noyce Scholarship  
Diana Sabatos (Brighton, CO)—\$13,500 Noyce Scholarship  
Lauren Zerr (Russell Springs)—\$13,500 Noyce Scholarship  
Seth Boxberger (Russell)—\$13,500 Noyce Scholarship  
Judson Tillotson (Valley Center)—\$13,500 Noyce Scholarship  
Sianna Miller (Goodland)—\$2,000 SEMI-Steffen Scholarship  
Kelsie Whitcomb (Wichita)—\$2,000 SEMI-Steffen Scholarship

Also during this past year, thirty-four students pursuing a major or a minor in mathematics or computer science were awarded a total of \$33,200 through prestigious named-scholarships and departmental scholarships. These scholarships are funded through both endowed funds and other designated gifts provided by friends of the department. The following FHSU students received high recognition and were awarded scholarship dollars from the Mathematics Department:

Kelsie Whitcomb (Wichita)—Elton & Wendy Beougher \$1,000 Scholarship  
Diana Sabados (Brighton, CO)—Moore Family \$1,000 Scholarship  
Judson Tillotson (Valley Center)—Moore Family \$1,000 Scholarship  
Sianna Miller (Goodland)—Moore Family \$1,000 Scholarship  
Patrick Cook (Derby)—Milham-Wasinger Annual Family \$2,500 Scholarship  
Fernando Guzman (Hays)—Milham-Wasinger Annual Family \$2,500 Scholarship  
Lailah Collins (Wichita)—Etter \$850 Scholarship  
Seth Williams (Hutchinson)—Baxter \$800 Scholarship  
Tanner Eiland (Hays)—Colyer \$800 Scholarship  
Fernando Guzman (Hays)—Marshall \$800 Scholarship  
Richelle Yanez (Overland Park)—Ogle \$800 Scholarship  
Keegan Chapman (Hays)—Toalson \$1,200 Scholarship  
Perla Comacho-Rosales (Liberal)—Denio \$1,500 Scholarship  
Seth Boxberger (Russell)—Tebo Family \$1,500 Scholarship  
Nicholas Schmidt (Hays)—C.W. Lowry \$500 Scholarship  
Pedro Ordanez (Hugoton)—Dr. Ellen Veed \$1,200 Scholarship  
Sianna Miller (Goodland)—Dr. Caroline Ehr \$800 Scholarship  
Patrick Cook (Derby)—P. Miller Math/Physics \$1,000 Scholarship  
Fernando Guzman (Hays)—Schippers Family \$1,000 Scholarship  
Tyler Bloom (Netawaka)—Ron and Cathy Sandstrom \$1000 Scholarship  
Ashley Pritchard (Wichita)—F.E. Schockley KAMS \$600 Scholarship  
Maximo Jovita (Kensington)—Zeng \$500 Scholarship  
Mackinzie Foster (Topeka)—E. Eltze Memorial \$500 Scholarship  
Kelsie Whitcomb (Wichita)—K. and D. Bahl \$200 Scholarship  
Dakota Blaylock (Halstead)—K. and D. Bahl \$750 Scholarship  
Trevor Kohl (????)—K. and D. Bahl \$500 Scholarship





Alexis Meinert (Garden City)—K. and D. Bahl \$500 Scholarship  
 Lauren Zerr (Russell Springs)—K. and D. Bahl \$500 Scholarship  
 Brianna Wooldridge-Kear (Edgerton)—Rice Graduate \$300 Scholarship  
 Thomas Broxterman (Hoyt)—Rice Graduate \$300 Scholarship  
 Chelsea Zimmerman (Hays)—Rice Graduate \$300 Scholarship  
 Meagan Feril (St. John)—Rice Graduate \$300 Scholarship  
 Tina White (Moscow)—Rice Graduate \$300 Scholarship  
 Aimee Overmiller (Beloit)—Rice Graduate \$300 Scholarship  
 Kellen Griffin (Tecumseh)—Rice Graduate \$300 Scholarship  
 Jayme Goetz (Hays)—Rice Graduate \$300 Scholarship  
 Jamie Spoonemore (Hillsboro)—Rice Graduate \$300 Scholarship  
 Josh Platt (Tribune)—Rice Graduate \$300 Scholarship  
 Lyle Thompson (Washington)—Rice Graduate \$300 Scholarship



Kenton Lindsay and Lane Bigge graduated Spring 2019.

Also using supporters' contributions, the Mathematics Department in conjunction with the Computer Science Department awarded the following departmental scholarships:

Derek Gray (Hays)—Mathematics Department \$500 Scholarship  
 Sadie Miller (Hiawatha)—Mathematics Department \$600 Scholarship  
 Hank McVeigh (Lincoln, NE)—Mathematics Department \$500 Scholarship  
 Jacob Gaughen (Hays)—Computer Science Department \$500 Scholarship  
 Devin Berens (Johnson)—Computer Science Department \$500 Scholarship  
 Dylan Greytak (Wichita)—Computer Science Department \$500 Scholarship

The Academic Opportunity Award (AOA) Scholarship in Mathematics, after a twelve-year stint at FHSU now in its last year, recognizes incoming freshmen to FHSU. This scholarship structure will be replaced with a multi-tiered awarding schedule that is based on incoming students' ACT/SAT scores and high school GPA. The outgoing AOA scholarship provided a two-tier structure with award amounts of either \$900 or \$500. This past year, ten AOA scholarships worth \$8,200 were offered to students interested in beginning a degree program in mathematics. From this group of prospective students, seven began classes in Fall 2019 for a total of \$5,900 in scholarships. Those students included:

Cadence Ohl (Maize)	Zoe Harris (Hutchinson)
Richelle Yanez (Overland Park)	Spencer Wittkorn (Hays)
Lorenz Manabat (Topeka)	Harold Hale (Lyons)
Karisma Vignery (Minneapolis)	

As in the past, the department is seeking assistance in recognizing and encouraging high school students and non-traditional students with an interest or talent in mathematics education or mathematics. The department has a goal to have at least fifteen well-prepared high school seniors and another five non-traditional students begin their higher education in mathematics at FHSU. But we continue to need the assistance of friends and alums to reach this goal. Please contact us with names of such prospective individuals—then the Mathematics Department will reach out to them and demonstrate the benefit of becoming a FHSU Tiger.

FHSU students are truly appreciative of the financial assistance received through the many contributions made by friends of the Mathematics department. If you have questions about departmental scholarships or have the ability to assist in identifying and/or recruiting possible Mathematics majors from your local region, please contact Jeff Sadler by email at [jsadler@fhsu.edu](mailto:jsadler@fhsu.edu) or by phone at (785)-628-4416. If interested in contributing either new or continued funds to any scholarship area, please do so by sending a check to the Mathematics department payable to the FHSU Endowment Association—specify the mathematics scholarship fund in general or a specific named scholarship of interest on the memo line.

