



THE INSTITUTE FOR ADVANCED PHYSICS

The Institute News

- **Clemson University colloquium: “Finally, What is a Photon?”**
- **Annual Pizza for Realists party and other social events at Clemson University**
- **Graduate research colloquium: *Not All Uniform B-Fields Are The Same!***
- **Dr. Rizzi at Legatus of Greenville, SC**
- **SBS college study group spring semester**
- **Conversations to Understand our World: *Love and Friendship* podcast**
- ***Science Before Science* published by Amazon**
- **IAP family picnic in Easley, SC**
- ***New Oxford Review* Grace article**

Clemson University Colloquium: “Finally, What is a Photon?”

By Benjamin Luna, Associate Member



On February 9th, Dr. Rizzi gave a colloquium at a packed Clemson University lecture hall on the exciting new work that the Institute for Advanced Physics (IAP) is undertaking in quantum field theory entitled “Finally, What is a Photon?”!

Quantum field theory (QFT) contains our knowledge of light, including photons. Photons are discussed starting in middle school and are usually described as particles of light, but this is false! This popular understanding is fed by unclear

transmission of the theory to teachers. The nature of the photon has not been theoretically proven before now, so Dr. Rizzi’s talk was of groundbreaking importance!

Using a quantum field theoretic description of the photon, Dr. Rizzi showed that the vector potential of a photon has a likely amplitude associated with a discrete frequency and therefore energy and momentum. In particular, by finding the wave-functional for the vector potential, he showed that the likely absolute amplitude spectrum has a delta function at a given frequency. Then he discussed how he extended this to n -photon systems and showed that such systems have a vector potential distribution whose most likely element has a strong sinusoidal component which has an amplitude corresponding to n -fold more energy than a single photon system. He also derived an analogous result for photons of different energy. Through the use of Parseval’s theorem for stochastic systems, the calculations and associated analyses introduced a simple tool for exploring the nature of the QFT Schrödinger

wave-functional generally, and this was then used to explain the nature of a photon!

Dr. Rizzi's exposition required him to introduce some of his other groundbreaking work, including the nature of the vector potential and the proper way to understand quantum mechanics (available in *Physics for Realists: Quantum Mechanics*, which, among other things, by using the ensemble interpretation and a generally full physical approach, avoids the standard "collapse of the wave function" approach). He walked up to his topic of understanding photons by first explaining how to properly think about Quantum Field Theory using Schrödinger wave functionals (which he pointed out has been almost completely neglected). He, in turn, did this by starting with classical physics and walking up to quantum mechanics. He also discussed analyzing the

interaction of the photon with a charged source as a next step.

The colloquium was very well attended and well received. Two former Physics Department Chairmen made a return to Clemson University to speak to Dr. Rizzi. There were many good questions asked during the Q&A session, and a spirited discussion of the talk and of the profound work of the IAP continued with Clemson students and faculty while refreshments were served after the Q&A session.

Dr. Rizzi's paper, "The Field Structure of Free Photons," is available on the arXiv as of January 2023 (<https://arxiv.org/abs/2301.11434>). Stay tuned for more exciting developments as IAP continues its essential work in grounding modern physics in the first things we know!

"Pizza for Realists" Party and other social events at Clemson University

By Michael Rutland, Volunteer Member

Dr. Murray Daw, Dean's Distinguished Professor of Physics at Clemson University and IAP faculty member, has been using the *Physics for Realists* textbook series written by Dr. Anthony Rizzi for over a decade at Clemson University. He started a tradition many years ago of hosting a pizza party each semester



called "Pizza for Realists" for any of his students (past and present) to attend.

While this tradition is long-standing and is always a big hit, the most recent Pizza for Realists was a special one indeed because Dr. Rizzi, who was in Clemson to give a colloquium, attended the party! This gave us students a great opportunity to ask very real (no pun intended) questions such as: "What is space?", "What is space-time?", "Is there any meaning to the fabric of space-time that people talk about?", "What is a manifold?", and "What is a tensor?". Dr. Rizzi answered all of our questions with amazing simplicity and completeness, and we students left the event very satisfied to have heard the grounded

answers to these questions that only Dr. Rizzi could give. Thank you Dr. Rizzi!

There were other exciting social events that took place during Dr. Rizzi's visit to Clemson, including a football game!



Michael Rutland is an IAP Volunteer Member who recently graduated from Clemson University with a degree in Physics



Graduate research colloquia: *Not All Uniform B-Fields Are the Same!*



Benjamin Luna, PhD candidate at Clemson University and IAP Associate Member, presented a talk on his graduate research called *Not All Uniform B-Fields Are The Same!* at

Tennessee Technological University's Undergraduate STEM Research Seminar and at Clemson University's Physics Colloquium this spring. This work continues the work presented in a previous talk of the same name, conducted under Dr. Murray Daw, Dean's Distinguished Professor of Physics at Clemson University and IAP Certified Member and Faculty, based on insights from the work of Dr. Anthony Rizzi's groundbreaking *Physics for Realists: Electricity and Magnetism*, which properly grounds the equations of electromagnetism in common sense.

Luna's talk goes through a problem in a famous undergraduate E&M textbook and demonstrates that, because the problem

assumes that all uniform B-fields are the same, the problem has several physically distinct solutions and cannot be solved as written.

Due to a foundational mistake in physical reasoning pertaining to the A-field, students and professional physicists alike dismiss the A-field and treat all locally uniform B-fields as if they were the same (in that limit of perfect uniformity) without qualification. In quantum mechanics, the Aharonov-Bohm effect makes the A-field hard to dismiss, but Luna presented a purely classical argument to show that the A-field does, in fact, capture a piece of physical reality in a simple way which is not captured by the B-field in the above limit alone. He did this by showing that not all uniform B-fields (in the above sense) are the same, and that they depend on the source which produces them.

Luna also pointed toward the root cause of the confusion: the ungrounded equation-alone state of modern physics. He urged his audience to ground their thinking about these issues by studying Dr. Rizzi's *Physics for Realists* textbook series, which explains the insights of modern physics in a fully-physical way for the first time.

Dr. Rizzi at Legatus of Greenville, SC

By John Sudnick, Associate Member



On February 7th, the Greenville, South Carolina chapter of Legatus was honored to have Dr. Anthony Rizzi as the featured speaker at their monthly meeting. Legatus is an international organization of Catholic laymen,

comprised of CEOs, presidents, managing partners and business owners.

In his talk, “Science ‘To Serve Man’, a Parable from the Twilight Zone”, Dr. Rizzi used an episode of *The Twilight Zone* (a popular TV show from the early 1960’s) to illustrate how scientism, the equation-only physics of modernity, is destroying our culture. The talk sparked much good discussion, with several Legatus members staying late into the night to talk more with Dr. Rizzi, and, as a result, a new study group based on Dr. Rizzi’s book *The*



Science Before Science is currently being formed among Greenville Legatus members!

John Sudnick is a mechanical engineer and former President of Project Integration, Inc.

Spring 2023 College SBS Study Group: School Year Ends Strong!

By Christian Captain, College Study Group Member

After the brief break over Christmas, the College *Science Before Science* (SBS) study group resumed regular weekly meetings via Zoom at the beginning of the Spring 2023 semester. Associate Members Giuseppe Rizzi and Ethan Robson led the group in finishing the second half of SBS. For each meeting, participants read a small part of SBS and were asked to think about and answer reading questions based on the reading assignment for the given week, as well as formulate a few simple questions of their own to ask others in the group.

The meetings included small group discussions and presentations wherein different members of the group were asked to

present on a variety of interesting topics from the reading. These helped everyone digest and understand the material on a deeper level and helped grow the friendships in the community.

In the second-to-last meeting, the study group enjoyed a special treat as IAP Director, Dr. Anthony Rizzi, joined to give a summary of the whole book and a Q&A session afterwards! It was very exciting to have Dr. Rizzi join the group, and everyone learned a lot and enjoyed his presence, expressing gratitude for his being there.

We will continue to meet over the summer for article discussions and game nights and will resume SBS meetings in the fall for the 2023-2024 school year!

Love and Friendship **podcast**

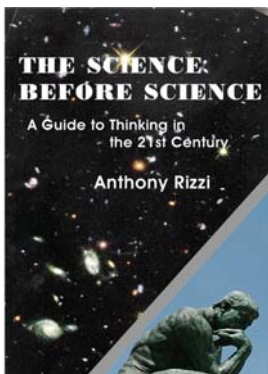
By Anthony DiCarlo, Membership Director

On Thursday June 15th, IAP's latest installment of *Conversations to Understand Our World: Interviews with Dr Anthony Rizzi* was broadcast via YouTube. This interview was about "Love and Friendship" and was based on Dr. Rizzi's profound article *Love and Friendship: What is Love? What is a Friend?* (available at <https://iapweb.org/iapmagazine.htm#vol3>). Fletcher Williams, IAP Associate Member and Assistant Professor of Practice, interviewed Dr. Rizzi about the true nature of love and friendship and the false ways we think about these things in our modern world because of the equation-alone thinking at the base of our culture. Many important insights from the article were expounded upon both during the interview and in the question and answer session that followed. The article is ground breaking, giving new understanding of the core meaning of love and friendship and the issues that spring from them, understanding that could only be given by someone who knows the foundational physics and the metaphysics that follows it as deeply as Dr. Rizzi. You don't want to miss this podcast! You can access the article and the podcast at <https://iapweb.org/friendship.html>.



GRAB THAT WORD is an online game app based off the game show "Pyramid." Try to get your teammate to say as many words on-screen as you can before time runs out. It's a great game to play with the whole family. This IAP version of the game contains many special features including a mode to practice the IAP vocabulary. It also includes a custom mode which can be used to practice your child's vocabulary for grade school as well as SAT or ACT words. This version of the app was donated to IAP by GR Programming. <https://iapweb.org/store/kids.html#grab-word>

Science Before Science published on Amazon



Dr. Anthony Rizzi's groundbreaking book, *The Science Before Science: A Guide to Thinking in the 21st Century*, is now being published on Amazon! You may purchase this groundbreaking book by using the link provided here: *The*

Science Before Science. You may also use the link provided here: https://www.amazon.com/Science-Before-Guide-Thinking-Century-dp-1734015217/dp/1734015217/ref=dp_ob_title_bk. (Please copy and paste the URL into your browser if clicking the link does not work.)

Dr. Rizzi (a distinguished physicist who solved an 80 year old problem with Einstein's theory) is uniquely qualified to address our scientific culture, having come to his own intellectual crisis point. What is the key to the truth and power of science? Would a theory of everything disprove the soul? Is matter all there is? Can I keep science and my common sense? Can we travel back in time? Is it evolution or creation or ...? Will scientists ever make a man? Will we ever create artificial intelligence? If so, what does that say about my worth? What is the ultimate source of our intellectual malaise? In *The Science Before Science*, he answers these questions in a lucid style, peppered with personal and historical anecdotes, accessible to every educated reader.

Dr. Rizzi is a man of science and faith. In this readily accessible book, he makes clear that there is a necessary connection, established by God, between real science and true faith. Indeed, man cannot be who he *is made to be* without both, as a bird cannot fly without both wings.

Paperback: \$19.95. Hardback: \$28.95.

IAP Family Picnic in Easley, SC

Some IAP families and friends of IAP in the upstate of South Carolina came together on July 8th for some fun and fellowship! They enjoyed a picnic dinner, some games, and lots of great conversation. Be on the lookout for opportunities like this one to be part of the IAP community in your area!



\$20,000 goal met for Matching Donations

Your donations between March 3rd and March 11th exceeded our \$20,000 goal!

**YOU DID IT!
THANK YOU!**

Our anonymous donor donated \$20,000 to double your generosity!

You can donate online at <https://www.iapweb.org/store/#donate>

or by check:

Institute for Advanced Physics
PO Box 15030
Baton Rouge, LA 70895

IAP is a 501(c)3 nonprofit organization

Coming Soon to EWTN--*Faith Matters* with Dr. Anthony Rizzi



The most recent episodes of *Faith Matters* with Dr. Rizzi begin airing on EWTN around July 10. There are a total of 11 episodes. These short-form programs (2 to 5 minutes each) will air as fillers between other EWTN programs. **Topics include:**

Faith and Reason	What is America?	Four Steps of Learning
Why Do We Think So Poorly?	Primacy of the Intellect	Friendship
Does Grace Help You Think Better?	Natural Law	Substance and Properties
Conflict between Faith and Science		
Star Trek II (about Good vs. Evil, Heaven vs. Hell, and Life vs. Death)		

Does Grace Help You Think Better? New Oxford Review interview of Dr. Rizzi

People often ask about the relationship between Faith and Reason, and it is essential to get this answer right. Because we start with what we see (everything we know comes through what we know through the senses), physics is the first science, that upon which all else we know and believe stands. We cannot even formulate any statement of belief without the basic knowledge obtained through our senses.

There are many things that have been understood for the first time or more deeply than ever before because of the deepening of our understanding of nature (and the recovery of lost knowledge) that IAP has provided through its research through its 20 year history. One might, for example, ask what can be said about the relationship between grace and nature applying this deep IAP background; Dr. Rizzi has recently addressed this issue.

In April the *New Oxford Review* published an interview of Dr. Rizzi entitled “The Effect of Divine Grace on the Human Intellect.” In it Christopher Beiting asks Dr. Rizzi questions about his article “Does Grace Help You Think Better?” (published in *Divinitas* as well as the

“Theologica” section of IAP’s *Physics and Culture* magazine). This interview and the article that it explicates (like other articles in the Theologica section) help illustrate how grace builds upon nature and that without nature grace is useless.

IAP is producing articles on a wide variety of relevant topics. To support IAP’s research that leads to the understanding and writing of these articles, **we ask for a donation of \$2 per article that you read or download.** Articles can be found at <http://www.iapweb.org/iapmagazine.htm>



Anthony Rizzi, Ph.D., founder and Director of The Institute for Advanced Physics (a 19 year old non-profit organization with Vatican backing), gained worldwide recognition in theoretical physics by solving an 80-year old problem in Einstein’s theory. He has physics degrees from MIT and Princeton University. Prior to IAP, he was senior scientist at Cal-Tech’s Louisiana LIGO and taught at LSU. LIGO won the 2017 Nobel Prize in Physics.

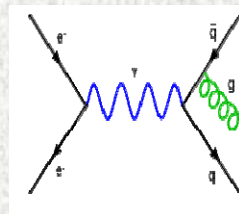
The Institute for Advanced Physics presents its 21st annual
conference



Quantum Field Theory V

Louisiana State University
by invitation only

July 19 – July 22, 2023



Check out resources at IAP's online magazine
including

Love and Friendship: What is Love? What is a Friend? **NEW**

Why do We Think so Poorly?

What is America?

What is the One Ring that Rules them all? (print or audio)

Is Temperature Real?

What is Science?

The World Just Got More Empirical Today

Death of Justice?

What is the Difference Between a Lab and a Border Collie?

Physics and "Judge not that you might not be Judged"

Is there in Truth, Beauty? (print or audio)

Is Your Computer Real?

How to Learn in Four Steps (print or audio)

A Brief History of Nothing

How Do I Know My Hand Causes Movement?

The Problem of Our Failing Culture and its Solution

Answering Dawkins on Simplicity of God

How to Have Productive Enjoyable Conversations (print or audio)

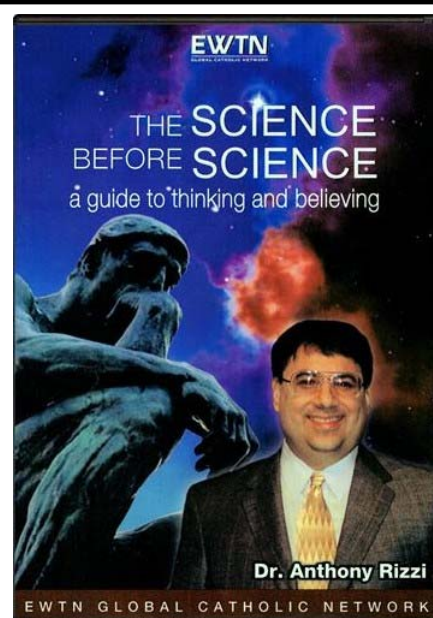
Historic Discovery: Gravity Waves!

View "gravity wave effect on man" animation

Read articles at: www.iapweb.org/iapmagazine.htm

In order to continue our important research and education outreach, we need your help. **Please support our work with a \$2 donation for each article you read** in our online magazines *Physics and Culture* and *Journal of Physics and Math*. Here is the link to donate: [Donate](#)

Please consider a larger donation



The Science Before Science DVDs

Using animation, music video and simple experiments, co-hosts Dr. Anthony Rizzi, Director of *The Institute for Advanced Physics*, and Marcus Grodi, EWTN host of *The Journey Home*, takes you through the first half of the book, *The Science Before Science: A Guide to Thinking in the 21st Century*. Learn the basic fundamentals of proper thinking, upon which all of our thinking and believing rests, the science before science.

Available for \$25 on IAP's website

<https://iapweb.org/store/>