

The Physics Journal Club
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Abstract

The Physics Journal Club is an innovative and successful outreach programs organized by the University of Tulsa Department of Physics and Engineering Physics. The club meets monthly during the academic year to discuss current progress in physics. The club will begin its twelfth year this coming fall. Attendees include current and former TU students and faculty, high school students and their teachers, and interested community members. Average meeting attendance is over a hundred. Prior to the meetings, articles from current journals are designated for discussion. At the meetings, dinner is provided, students review the designated articles, physical principles drawn from the articles are demonstrated, and audience members join in a spirited, open discussion of the topics. The club has accomplished a number of goals, including fostering interest in physics, improving attendees' breadth and depth of understanding of physics and its applications, aiding in student recruiting, maintaining contact with alumni, and creating a positive image of the university within the community.

What is the Journal Club?

For over a decade, the Physics & Engineering Physics Department of the University of Tulsa has organized an innovative and highly successful physics outreach program to the greater Tulsa area known as the TU Physics Journal Club. The Journal Club is a monthly meeting during the academic year to discuss current progress in physics and its applications to technology. The club began in the fall of 1997 and will begin its twelfth year this coming fall. Participants include current and former TU students and faculty, high school students and teachers, and interested members of the community.

Two weeks prior to the meeting, two articles from current science journals are designated for discussion via an e-mail announcement to the club's mailing list. The articles selected are targeted for collegiate freshmen. Articles are selected from journals such as *Scientific American*, *American Scientist*, and *Discover*. Articles from *Physics Today* and *American Journal of Physics* are usually too difficult while those from newspapers and magazines such as *Popular Mechanics* are not challenging enough. Articles are chosen for their focus on physics and its applications, or on physics history and its personalities. For instance, articles discussed at recent meetings included "The Sounds of Spacetime" (*American Scientist*, November-December 2006) about Special Relativity and gravitational waves, and "The Many Worlds of Hugh Everett" (*Scientific American*, December 2007) about the creator of the many-worlds interpretation of quantum mechanics. Participants are often asked to read a third article of their choosing.

Who Comes to the Journal Club?

The meeting began as a required component of a freshman-level course entitled, "The World of Physics." Thus the attendees initially were primarily incoming students majoring in physics or

engineering physics, and department faculty. The goal of the meeting was to foster interest in physics in our new students through free-ranging discussions outside the classroom. We also wanted to expose students to the broad range of topics encompassed by physics and represented in the literature. Finally, we wanted our new students to develop a sense of community with other students and faculty in the department through contact away from the classroom. Average meeting size that first year was eight to ten students. The meeting is still required for current students of The World of Physics class.

It was not long before we began to see the value of these meetings to department and college recruiting efforts. We found that the best and brightest secondary science students in our area had limited opportunities outside class to further their passion for physics, or to interact with students and faculty with similar interests. These students' prospects for informed discussions about cosmology and high-energy physics, for instance, were rare.

In consequence, we began inviting prospective students to join our meetings. We took advantage of the fact that getting a student to come to campus significantly increases the potential that they will enroll in our university. Even if such students did not matriculate in physics, the probability of their enrolling in another of our college's science and engineering departments was enhanced. On several occasions, our admissions office has made use of our mailing list to augment its own recruiting efforts. Though we have not kept records over the years of attendees who subsequently enrolled at TU, our admissions office has frequently commented on the significant contribution to recruiting the Journal Club makes.



Figure 1. An Early Journal Club Meeting

We also saw value in inviting our department alumni to the meetings. Even if our graduates went on to careers in other fields, they often retained a keen interest in physics that was whetted by the monthly meetings. The gatherings are a means for our department to maintain and cultivate important relationships with local alumni of our department.

With our meetings growing in size and reputation, we began to receive requests from local secondary teachers to attend with their students. Once we opened the meetings to these requests,

we also began to attract interest from other members of the community at large—doctors, engineers, and other professionals, as well as curious parents/chauffeurs of our secondary-student attendees. Our numbers grew to an average 110 per meeting. The largest group we have had to date for a regular meeting was 130, with 275 attending a special, end-of-year physics show.

In the course of our eleven years of meeting, we have had students and their teachers attend from nearly every high school in the greater Tulsa area. One semester, we had a group of four students and their teacher travel over three hours one way from a rural Oklahoma town to attend the gatherings.

What Happens at the Journal Club?

Initially, we held our meetings at faculty members' homes to allow our new students to interact with each other and faculty members in a more congenial environment, away from the antiseptic classroom. As our meeting size has grown, we have reserved more spacious and well-appointed venues on campus such as the Faculty Study in the university library or the President's Lounge in the Student Activity Center. We avoid meeting in classrooms and auditoriums if possible.

We schedule our meetings to be the second Tuesday of each month, from 6:30 to 8:30 p.m.. We operate according to the dictum, "If you feed them, they will come." We provide pizza, cookies and pop free of charge to the attendees. The first half hour is devoted to letting students settle in with food and conversation. At 7:00 p.m., we begin the formal part of the meeting.

The formal portion of the meeting starts with a welcome and recognition of the various groups present. We circulate a sign-up sheet for attendees to be included in the announcement e-mail list. We then devote a half-hour each to the review and discussion of the designated journal articles.

Prior to a meeting, when the articles are first selected, we recruit volunteers from the ranks of our physics students to review the articles. At the meeting, these students stand to review their paper. The students' review is intended to refresh the audience's recollection of the paper. It is also an opportunity for the students doing the review to gain experience in public speaking. The student review lasts about seven minutes and includes:

- a summary of the main topics
- a discussion of the physics involved
- anything intriguing about the article
- opportunities for further investigation and application
- questions

We have learned that students respond enthusiastically to any physics demonstrations we do. Consequently, we follow the formal review with one or more demonstrations that illuminate some physical principle mentioned in the article. These demonstrations usually last another seven minutes.

The remaining time for an article is open for contributions from members of the audience. We encourage attendees to share insights and questions they have about the article. During this discussion, the moderator works to promote vigorous audience participation by:

- constantly referring attendees' comments and questions back to the audience instead of attempting to respond to them himself or herself;
- not allowing any one audience member (especially faculty members!) to dominate the discussion;
- creating a "safe" environment by discouraging overt criticism of participants' comments and questions, even when they are patently incorrect (the truth has a way of coming out in the end).

These efforts result in audience "ownership" of the meeting.

After the two designated articles have been reviewed and discussed, we usually have about another half hour left in the meeting. We have used this final half-hour in various ways. Sometimes we ask attendees to find and read a third article of their choice, then go around the room asking them to relate their articles in 30 seconds or so. In this way, all attendees have the opportunity to speak up during the meeting, and participants learn of physics news they might not have otherwise encountered. On other occasions, we use the time to do an extended demonstration. And occasionally we devote the time to special presentations by students or by faculty members in their area of expertise. Regardless of how we use the final half-hour, we make sure to end our meetings on time (8:30 p.m.).

We have learned that attendance and attendees' preparation tends to decline the last meeting of the academic year (April). This is attributable to end-of-the-year demands on students. In response, we now use that last month to present a one-hour show of physics demonstrations that has become highly popular. This past year, a standing-room-only audience of 275 attended the presentation.



Figure 2. End-of-the-Year Physics Show

What Does the Journal Club Cost?

Since the meeting announcements are handled by e-mail and campus meeting rooms are free of charge, the only dollar cost of the meeting is for catering. Our cost is about four dollars per attendee; with our current meeting size, individual gatherings cost five- to six-hundred dollars. Since we meet each month September through April, yearly costs are about \$4000. In the early days of the Journal Club, food costs were born by the physics department. As we have grown, the Dean of the College of Engineering and Natural Sciences has picked up the expense of the meetings in recognition of their positive exposure in the community and their recruiting value to the college.

There is significant, non-monetary cost to the faculty members involved. These include:

- finding journal articles for discussion;
- maintaining and updating the participant e-mail database;
- recruiting students to review articles
- scheduling rooms and catering;
- preparing demonstrations for the meetings;
- attending and conducting the meetings

What Feedback Has the Journal Club Received?

The Journal Club has been received enthusiastically by its participants as evidenced by its longevity and its continual growth in audience size. Following are comments we have received over the years:

- “The Journal Club is not quite like anything I’ve ever seen before. It’s not the fact that it delves into technical, intellectually stimulating physics conversations that makes these get-togethers so special, but the fact that they are relaxed, interesting and entertaining opportunities to share some time with peers and faculty members. These meetings serve to reinforce the sense of close community in our physics department, and I’m beginning to realize how rare that is to begin with.” Aubrey Price, TU freshman physics major.
- “I am excited to be a part of TU’s Journal Club. It gives me an opportunity to hear about and to discuss exciting new advances in physics, to meet and talk with physics faculty members and students, to see other members of the community and to interact with them about those interests of theirs which are similar to mine. It gently compels me to read more in the physics literature, which in turn leads my children (through comparably gentle compulsion) to read and learn more in this area. I am deeply grateful for this avenue in education which combines for us the social and academic environments.” Dr. Eddie Abbot, Doctor of Obstetrics and Gynecology, TU physics alumnus.
- “My students attend so they can discuss aspects of physics that we do not normally get to in our one-year study. These topics that really seem to excite students—cosmic rays, quarks, anti-matter, black holes, time travel.” Marty Peters, high-school physics teacher, Tulsa.

- “My students get to see that they can hold their own with collegiate students. It makes college much less intimidating for them.” Rebecca Morales, intermediate high school chemistry teacher, Tulsa.
- “After a trip to the Journal Club, my students were so enthusiastic that I reserved a van for the remainder of the semester. I have a waiting list. One month, over ten of us attended.” Carol Seljeseth, high-school physics teacher, Putnam City, Oklahoma. (*Putnam City is two hours away from the University of Tulsa.*)
- “The Journal Club concept is brilliant. I wish other departments would do the same.” Nancy Pilkington, former recruiting coordinator, TU College of Engineering and Natural Sciences.

Summary

The Physics Journal Club is an innovative physics outreach program by the University of Tulsa Department of Physics and Engineering Physics. The club has made a number of important contributions to the department, college, university and community over its eleven-year history. Its longevity and membership attest to its success. One administrator has referred to the club as “the most successful outreach program at the university.”

Biographical Information

JERRY MCCOY

Mr. McCoy is an Applied Assistant Professor of Physics and Engineering Physics at TU. He earned a B.S. in Engineering Physics in 1980 and an M.S. in Applied Mathematics in 1991, both from the University of Tulsa. Mr. McCoy is starting his 16th year of teaching a range of undergraduate physics courses and labs. He was recognized by the Oklahoma Science Teachers Association as the 2004 Oklahoma Higher Education Educator of the Year..

SCOTT HOLMSTROM

Dr. Holmstrom is an Associate Professor of Physics and Engineering Physics at the University of Tulsa. He earned a B.S. from Missouri St. University, an M.S. from Oklahoma St. University, and a Ph.D. from Australian National University. His research is in experimental optics and focuses on the optical properties of chiral nematic (cholesteric) liquid crystals. Dr. Holmstrom teaches optical physics and pre-medical physics.

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Dr. Hari is an Assistant Professor of Physics and Engineering Physics at the University of Tulsa. Dr. Hari earned a Ph.D. from the University of Utah. After obtaining post doctoral training at NHMFL, Texas A& M University and Vanderbilt University, Dr. Hari joined the University of Tulsa physics department in 2003. Dr. Hari has published over 35 peer-reviewed articles and is represented in the 2006-07 edition of Who’s Who Among America’s Teachers.