

OpSci Research

In the Wyant College of Optical Sciences we do a lot of research, and I mean a lot. Every year we receive funding for over \$20M in new research. Of course the individual research projects can be spread over a few weeks to many years, so we do not spend each year's \$20M+ in one calendar year. However, it all averages out over the long term such that each year there is over \$20M being devoted to the College's research program. Currently, we have around 700 people associated with the College, including students, so if this funding was allotted equally. It would amount to a yearly salary of just over \$28,500. All the caveats have to go out though – some of this funding is spent on equipment, some is spent on outside individuals, and, of course, there are a limited number of positions that partake in this research. By "limited number" it is meant less than the 700 total. What am I trying to say? Simply, there is the potential to find employment in the research groups within the College or associate groups in other departments on campus, such as Engineering, Astronomy, Physics, and so forth. Let me spend some time describing the research program in the College, followed by a short discussion of how you can find a position in a research group.

OpSci Research Areas

We have separated the OpSci research into four areas:

- **Optical Engineering:** in the academic side of optics this is where we predominately treat light as a ray (i.e., geometrical optics). Of course the other interpretations of light come into play. Research areas include: optical design (OPTI 201R, OPTI 202R, OPTI 340), polarimetry (OPTI 484), remote sensing, optical fabrication (OPTI 415), metrology (light as a wave is needed here!) (OPTI 415, labs), optomechanics (OPTI 421), illumination (OPTI 485), radiometry (OPTI 306), ophthalmic optics (OPTI 435). As undergraduates a majority of your courses are in this area.
- **Imaging:** this is more of an application area that uses the three interpretations of light to make effective images in virtually all spectral regimes. Research areas include: standard imaging (OPTI 205), image processing, computational imaging, biomedical optics (OPTI 420), aerospace imaging, medical imaging and technologies.
- **Photonics:** in the academic side of optics this is where we predominately treat light as a wave (i.e., physical optics). Of course the other interpretations of light come into play. Research areas include: optical communications (OPTI 430), photonic integrated circuits, fiber lasers (OPTI 430, OPTI 370), semiconductor lasers (OPTI 341), detectors (OPTI 341, OPTI 306), remote sensing, and electromagnetic waves (OPTI 210, OPTI 330).
- **Optical Physics:** in the academic side of optics this is where we predominately treat light as both (i.e., quantum optics). Of course the other interpretations of light come into play. Research areas include: quantum optics (OPTI 345), atom optics, nanophotonics, nonlinear optics.

Essentially, while we are one College / one Department, these research areas delineate the four "departments" or groups within the College. There are distinct faculty and research projects within the four groups, but there is overlap between the groups – including faculty and

research projects. First of all, Optical Engineering is the most applied (i.e., it speaks to the engineering aspect of the College), while Optical Physics is the most fundamental (i.e., it speaks to the science aspect of the College). Second, there are many professors conducting research across these areas. Here is a (incomplete) list of professors:

- Optical Engineering:
 - o [Roger Angel](#)
 - o [Brandon Chalifoux](#)
 - o [Jeffrey Czaplá-Myers](#)
 - o [Ronald Driggers](#)
 - o [Matt Dubin](#)
 - o [John Greivenkamp](#)
 - o [Michael Hart](#)
 - o [Hong Hua](#)
 - o [Daewook Kim](#)
 - o [John Koshel](#)
 - o [Ron Liang](#)
 - o [Tom Mllster](#)
 - o [Michael Nofziger](#)
 - o [José Sasián](#)
 - o [Jim Schwiegerling](#)
 - o [Yuzuru Takashima](#)
- Imaging:
 - o [Amit Ashok](#)
 - o [Jennifer Barton](#)
 - o [David Brady](#)
 - o [Russell Chipman](#)
 - o [Lars Furenlid](#)
 - o [Art Gmitro](#)
 - o [DK Kang](#)
 - o [Matthew Kupinski](#)
 - o [Meredith Kupinski](#)
 - o [Leilei Peng](#)
 - o [Travis Sawyer](#)
 - o [Urs Utzinger](#)
 - o [Russell Witte](#)
- Photonics:
 - o [Pierre-Alexandre Blanche](#)
 - o [Mahmoud Fallahi](#)
 - o [Linran Fan](#)
 - o [Saikat Guha](#)
 - o [Khanh Kieu](#)
 - o [Thomas Koch](#)
 - o [Ray Kostuk](#)

- [Masud Mansuripur](#)
- [Euan McLeod](#)
- [Bob Norwood](#)
- [Stanley Pau](#)
- [Nasser Peyghambarian](#)
- [Judy Su](#)
- [Zheshen Zhang](#)
- [Quntao Zhuang](#)
- Optical Physics:
 - [Brian Anderson](#)
 - [Rolf Binder](#)
 - [Poul Jessen](#)
 - [Jason Jones](#)
 - [Miroslav Kolesik](#)
 - [Jerry Moloney](#)
 - [Pavel Polykin](#)
 - [Arvinder Sandhu](#)
 - [Dal Wilson](#)
 - [Ewan Wright](#)

As stated this list is not complete – in addition to tenured/tenure-track professors in the College, it includes some OpSci research professors and some joint professors whose homes are outside the College. To see the full list of professors with a connection to the College see:

<https://www.optics.arizona.edu/research/faculty/directory>

I also provided links to their profile pages that are maintained by the College. On those profile pages you can often find a link to a website(s) that they maintain. It is on these linked websites where you can find what is the focus of the group at this time, links to their publications, and posts that highlight the news within the group. Simply, it is these website where you will co research on the research groups.

OpSci Research Employment

Before you start talking to the various professors, you must do your due diligence to find out what work is being done. There are a number of reasons for this:

- Make sure you are interested in the research – if you are not interested, it will be harder to do the work. So, ask yourself, what interests do you have within the large field of optics?
- Find the professors who overlap with your interests by looking at both the faculty profiles that are maintained by the College and at the personal websites. There are many professors, so devote the time to find the groups that would overlap best with your interests. To get access to all the professor personal research websites, visit:

<https://wp.optics.arizona.edu/sites/faculty/>

- Review the research that is currently being conducted so that you have a basic knowledge of the science and engineering. If you get an interview, you must show interest and knowledge about their research.
- You could even talk to the current students in the group to find out more about the current work, the group atmosphere, and the other details that can make the work more engaging.

Note that some professors will announce on their personal research webpages that they are looking for students, undergraduate and graduate. So, make a habit of visiting these pages if you are looking for a new opportunity.

Upon locating professors for whom you might like to work, send them an email with your up to date resume, short explanation of your interests, and ask them when you could meet. When will you hear back? Typically within a couple days, but there are times when you will not get a reply. The lack of a reply does not mean they do not have a position or that they are not interested, but, rather, professors can get quite busy. So, they do not reply right away, and then the email comes in and then more comes in and so on. All you know is that they did not respond. I encourage you to give it a week or maybe a little less, upon which, send another email, call them, stop by their office, whatever. The worst that can happen is that they say they do not have a position. The best is that they do have a position and that you are hired. Usually the response is somewhere between these two ends, such as “I have volunteer positions,” “Can we talk next week?,” and “Not this semester, but definitely next semester.” In the end you may have to be persistent, but your effort will typically lead to a position in one of the many research groups. Remember, before your interview, make sure you do your research on their research. It is quite true that the professors like to talk about their research. They may tell you that they only have a few minutes to talk, but once the conversation starts on the group’s research, the conversation can go for a long time.

Finally, Brian Anderson (Associate Dean for Graduate Academic Affairs) or myself (Associate Dean for Undergraduate Academic Affairs) can assist you in locating the groups who best overlap with your interests. If you are not finding your interests, email or come and talk to us. Good luck in your search!

Photon Snacks is a column for Light Bytes edited by John Koshel, Associate Dean for Undergraduate Affairs in the Wyant College of Optical Sciences. You can find the previously written articles at <https://wp.optics.arizona.edu/jkoshel/photon-snacks/>. Additionally, make suggestions for articles (or even write one!) by emailing jkoshel@optics.arizona.edu or by visiting the survey anytime at <https://forms.gle/ibC9LhPemeniJwhv9>.