

...revealing secrets hidden in photons, materials that usher light to physical extremes, and imagers and cameras that see the world as never before...

I am Predrag Milojkovic, DARPA Defense Sciences Office program manager. I am an electrical engineer by training. The physical world always fascinated me, and in addition to engineering, physics and astronomy are my lifelong interests. When I was a kid, I developed a great curiosity about things around me. I wanted to know how things work, so I used to take apart every toy to see what's inside. All things electrical and mechanical fascinated me, and I wanted to know not just how things move and do something, but what is it that makes them do that, what's behind it all. And once you start asking these questions, and absorbing every little bit of knowledge and information available to you, and keep searching for more you are on a path towards becoming a true scientist or engineer. And the thing that's moving you is curiosity and the ability to observe, wonder, and ask the right and wrong questions, and search for answers, and keep trying. And I would dare to say that those things and traits are also pretty essential for a good DARPA program manager.

I've been at DARPA for about a year and a half. DARPA is exciting to me as a place where I feel empowered to create and pursue programs that could shake the foundations of how things are done in the field of optics and imaging, which is my portfolio. The Defense Sciences Office is about changing paradigms—looking at things in completely new ways, finding openings into new worlds that have not been explored, and enabling us to do things not possible before. My program REVEAL is trying to find ways to exploit direct—but also indirect and scattered and usually disregarded and rejected light—to enable seeing things not visible to ordinary cameras and imagers. It's an ongoing program, and we are always looking for fresh ideas. So let us know if you think there are new and better ways to achieve its goals—we'll listen!

I am working on establishing a new program, called EXTREME, where I would like to challenge some fundamental tenets of optics and break away from artificial bounds imposed by our inability to shape and design materials at the level of meta-atoms, and to engineer optical materials with currently non-existent capabilities to manipulate and shape light at the bulk scale. Some of the potential outcomes could be fairly extreme: one could be reconfigurable multi-functional optical components; another outcome could be lenses and mirrors that don't follow traditional laws of light propagation, and enable optics that are very different from anything that exists. And we might develop new multidimensional light sensors, ultra-fast and extremely fine wavefront shapers, and a host of other new things. And as always, I am interested in pursuing new ideas for extreme cameras and imaging: extreme resolution, no power, extremely small, distributed apertures, and adaptive maximized information extraction, and dynamically adaptable.

Another interesting topic is synthesis of arbitrary light fields. Yet another may be a total situational awareness and complete knowledge of all sources of photons that reach some location. Can I know which of the photons illuminating me shouldn't be there? What can I do about them? And so on....

If you have ideas in optics and imaging that you believe can change the world, please let us know—your ideas are the fuel on which DARPA runs! Thank you.