The need for reducing greenhouse gas emissions and generating energy from renewable sources is more crucial now than ever before. This has now become imperative because the planet is on the verge of a tipping point with regards to the effects of greenhouse gases on the average temperature of the earth. My work with this regards is divided into two parts. The first facilitates the adoption of more renewable energy generation methods, specifically concentrated photovoltaics, in which nonimaging lenses for solar concentration are used.   
Genetic algorithms are utilized as a way of designing and evolving such novel shaped lenses with a high half acceptance angle. Two main categories of lenses are explored; the first with a uniform material composition and the second with a gradient refractive index along one and both axes of the lens. Detailed and specific designs of the genetic algorithm and operators are developed and designed for this purpose. In the second part of my work, the emphasis is on creating thin film organic based electronics. These organic electronics are also lightweight, flexible and can be stretched to cover large surface areas. Many applications benefit from thin film embedded electronics such as carbon fiber composite structures. This new kind of smart electronics integrated within composite materials can help in significantly slashing the emissions of greenhouse gases in the transportation sector. This is especially the case in high emissions transport vehicles such as air planes. Light weight, low emissions aircraft that are also safe because of the redundant smart electronics within their design make them more adoptable.

