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How the Hayase Lab came into being

The Hayase lab started in April 2010. Let's see how it originated.

April 2010

Our lab made its start from a totally empty space. To begin with, air-conditioning and electrical work was installed to provide the basic environment for making experiments. I visualized the room layout, imaging a picture of our lab's future by myself.

July 2010

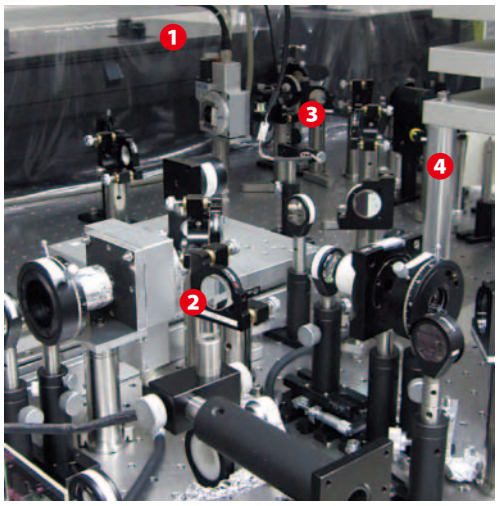
We purchased pieces of experimental equipment one by one, using the hard-won funds. Delivery of a special laboratory table for optical experiments is shown here.

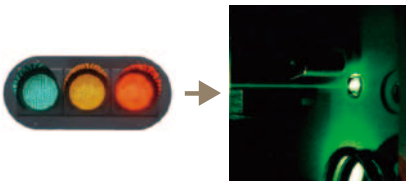
June 2011

Our students have assembled all of these optical components arranged on the laboratory table on their own. We are highly motivated to produce great research results, using our original measuring systems.

Points the Hayase Lab is particular about!

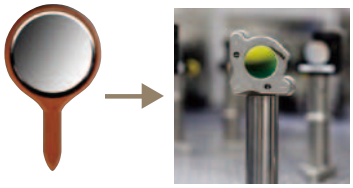
We'd like to introduce some of our equipment by comparing them with our everyday items.





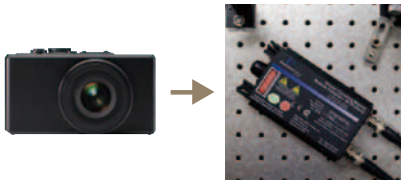
1 Ultrashort pulse laser

This laser is indispensable for conducting optical experiments. What makes this laser markedly different from LED and solar light is that it can generate light with a uniform wave phase (coherent light). Of particular interest is that the ultrashort pulse laser used in the Hayase lab is capable of emitting an intense light instantaneously within an amazingly short period of 10^{-13} second – an extremely short period of time in which light that can travel seven and a half times around the Earth per second is allowed to advance only by a distance equivalent to the thickness of a hair.



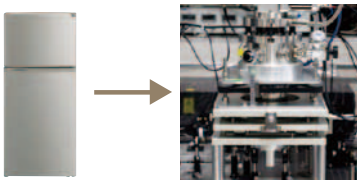
2 Dielectric multilayer mirror

Mirrors we typically use are coated with aluminum (metal) and have a reflectance of approximately 80%. Meanwhile, the mirror we use in optical experiments is of a special construction made by stacking layers of an electrically insulated substance known as dielectric. According to design, its reflectance can be freely adjusted from nearly 0% to 100%.



3 Single photon detector

This ultra-high-sensitive detector counts photons (the smallest unit of light energy) one by one. The amount of energy held by one photon is equivalent to 1/10 billionth that of an LED lamp. It can capture one single photon, using a special semiconductor device with a sensitivity 1,000 times that of the latest digital camera.



4 Cryogenic cryostat

This cryostat is used to cool semiconductor quantum dots. Cooling is necessary to retain their quantum-mechanical properties over a long period of time. The cryostat realizes a cryogenic environment of -270°C, using liquid helium that is even lower in temperature than liquid nitrogen. You may be able to imagine that cryogenic condition if you compare it with household-use freezers (approximately -18°C).