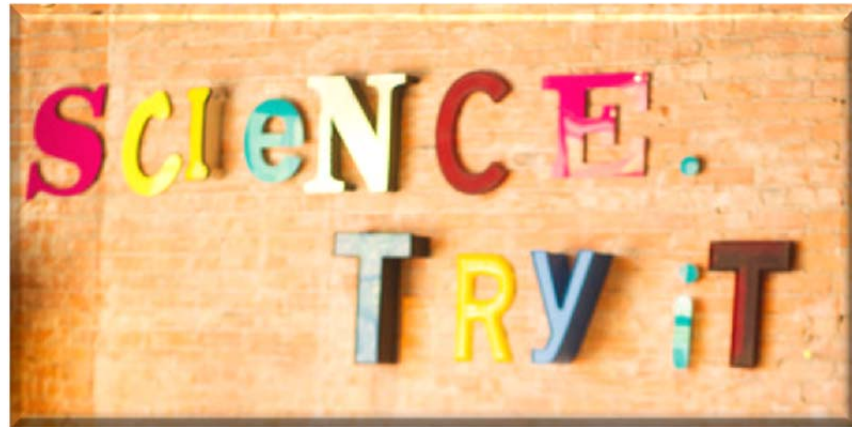




App Note #3:

NIGHTSEA helps U Montana's exciting *spectrUM* Discovery Area uncover the hidden world of neuroscience.



The University of Montana (Missoula, Montana) takes science education seriously. In addition to providing science curricula for its own 14,000 students, UM has created the *spectrUM* Discovery Area, (<http://spectrum.umt.edu>), an energetic science outreach program for both the local and state-wide communities. *spectrUM*'s fixed locations on the University of Montana campus and in the heart of downtown Missoula combine with its mobile Montana *spectrUM* Science Experience (MosSE) to reach a rapidly expanding local and state-wide audience.

spectrUM is an interactive science museum, built for kids but with tremendous appeal for grown-ups and family. Students can explore *spectrUM*'s exhibits through educator-guided field trips, after-school programming, and dynamic family science nights. Exhibits have been designed around state standards and center around topics such as neuroscience, nanotechnology, motion, health sciences, urban ecology, river dynamics, and much more. UM must be doing something right: *spectrUM*'s programming is now open five days a week, from 10AM until 5PM, and, between its museum and mobile programs, will exceed 50,000 visitors in 2013.

Unique to *spectrUM* is the BrainZone, a working lab collaboratively created and designed with *spectrUM* by UM's Center for Structural and Functional Neuroscience. Funded by NIH and staffed by UM researchers and Missoula High School students, BrainZone provides interactive activities for kids of all ages to explore neuroscience. Experiments range from dissecting a sheep brain, to experimenting with optogenetics in which light is used to activate different brain circuits, to competing in a game involving donning a headset that will read their brain's alpha waves and move a ball. The lab is the only one of its kind in the entire world.

"[Our] goal," cites *spectrUM*'s director, Holly Truitt, "is to inspire kids to pursue higher education and perhaps careers in science, engineering, math or technology."

Science comes to life...

Fluorescence provides a wonderful gateway to science in general and neuroscience in particular. Visual and easy to explain, it also contains a certain mystique: Why does blue light coming from the light source result in green light coming from the object? Why do only some things “light up” while others remain hidden in the dark? Questions like these open opportunities for discussing the physics of light as well as chemistry and biology.

UM Neuroscience researcher, Sarah Certel, and the BrainZone staff have designed and implemented fluorescence demonstrations for students of all ages. A simple bench top experiment reveals a hidden world of fluorescence to kids too young to see through a microscope. Slow moving but active fruit fly larvae (*Drosophila*) make a great test subject. All it takes is NIGHTSEA’s “magic” BlueStar flashlight to activate the fluorescence and the matching “cool” goggles to act as barrier filters to block out ambient light to see that there is something special going on in what appeared to be a random population of wiggly critters.

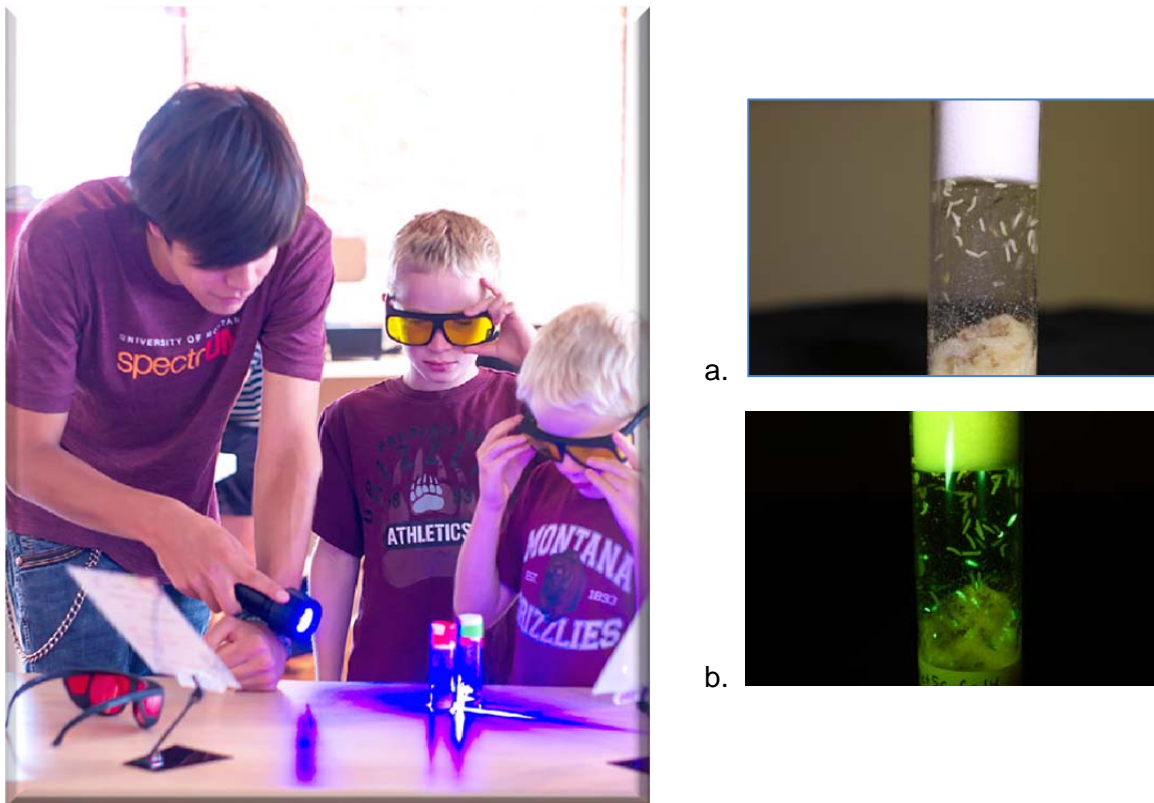


Figure 1. Using NIGHTSEA’s special BlueStar flashlight and goggles to investigate fruit fly larvae. (L) A simple bench top experiment. (a) Larvae viewed with regular white light (b) The BlueStar reveals that not all larvae are the same.

Growing with science

As children mature, their eyes are able to adjust to looking through the binoculars on a microscope and fluorescence experiments grow to keep pace. Using NIGHTSEA's newly-developed Stereo Microscope Fluorescence Adapter (SFA), any stereo microscope now can be fitted for fluorescence.

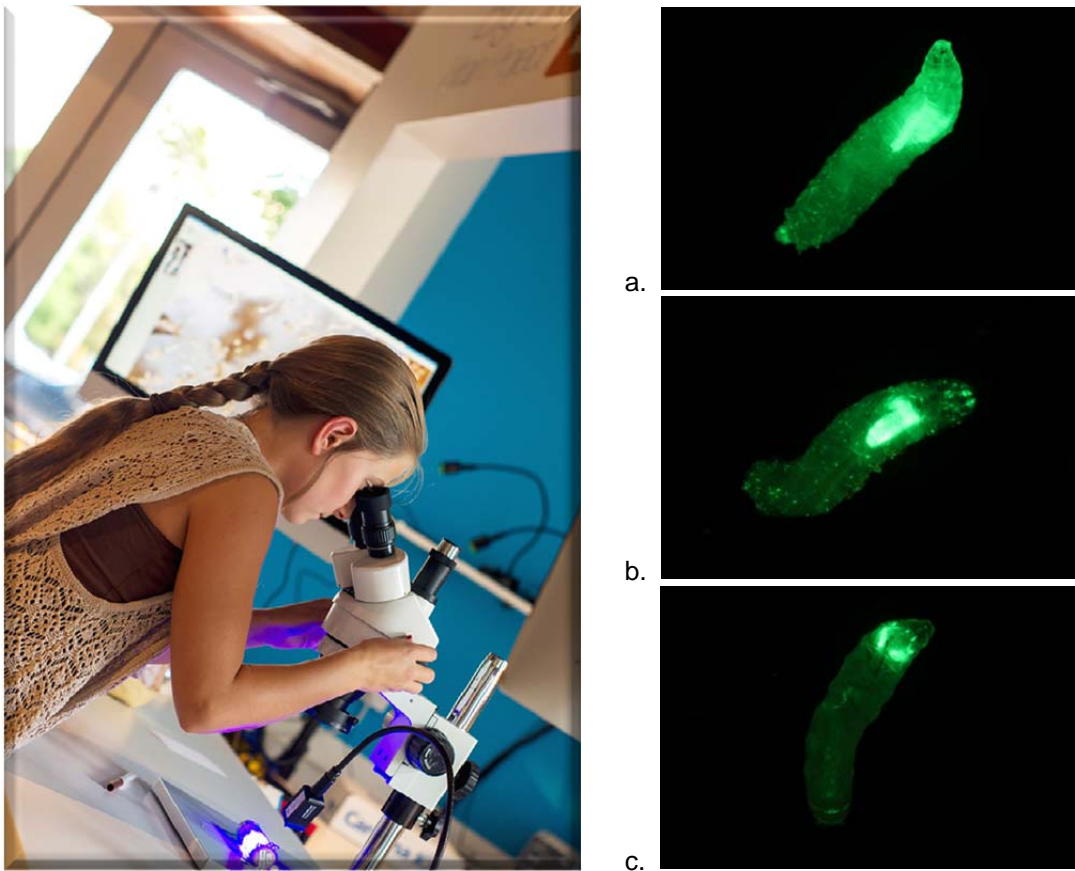


Figure 2. Using the Stereo Microscope Fluorescence Adapter (SFA) moves the study of fruit fly larvae to the next level. The three panels on the right illustrate selective use of GFP to highlight (a) the actin filaments which are pervasive through the larvae, (b) the peripheral and central nervous system, and (c) the salivary glands and cells that will develop into the eyes.

As shown in Figure 2 and detailed more completely on the next page, the SFA consists of an easy-to-use LED light source mounted on a goose neck, a barrier filter magnetically mounted beneath the objectives, and a light shield. Blue excitation was chosen for this experiment to best illuminate GFP, however the SFA also comes equipped for violet, cyan, and green excitation, as well as a white light illuminator.

MosSE: Transforming gyms and cafeterias into powerful local learning centers

At *spectrUM*, exciting, interactive science isn't just reserved for their UM campus or downtown Missoula science centers. The "Montana *spectrUM* Science Experience" (MosSE) travels. To date, MosSE has worked with over 27 schools in half of Montana's counties and all of the Native American reservations. Because they are robust and easy-to-pack, both the BlueStar kits and the SFA make taking science on the road easy. According to Director Truitt, the kids love having *spectrUM* visit their cafeterias, gyms, and libraries, inspiring Montana's next generation of scientists, health care providers, engineers, and visionaries. Because of the variety of experiments and compliance with state standards, any school is sure to find an exhibit that can fit into multiple levels of their curriculum.

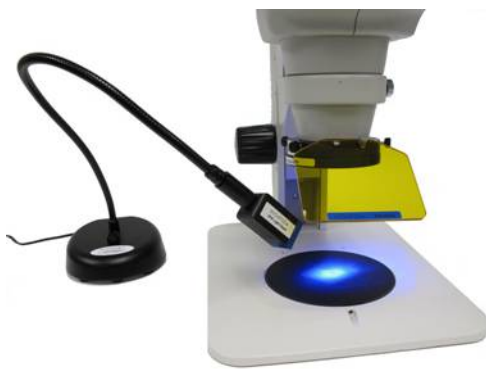
A Word about BlueStar and SFA



The **BlueStar flashlight** combined with the matched barrier filter glasses is a convenient, powerful tool for exciting fluorescence in many subjects:

- **Researchers in bio labs** - Works great with GFP, eGFP, fluorescein, lucifer yellow, other fluorophores
- **Marine scientists** - Scan marine specimens for fluorescence; Examine settlement tiles for juvenile corals
- **Reef aquarium hobbyists** - Bring out the true fluorescence in your tanks; Scan for new life too small to see any other way
- **Anyone** - Explore for fluorescence in your world – your kitchen, your garden, anywhere!

The BlueStar packages are available with a choice of three styles of filter glasses. The VG1 glasses are like basic safety glasses, while the VG2 (fits over eye glasses) and VG3 are more stylish. All of the filter glasses conform to ANSI Z87.1 impact standards for safety glasses



NIGHTSEA's Stereo Microscope Fluorescence Adapter

fits virtually all stereo microscopes. The ring for attaching the barrier filter fits below the objective, secured by thumbscrews with no modification to your existing microscope. The individual barrier filters just click into place magnetically. Light heads insert rapidly onto the gooseneck with a quarter twist to lock, making them easy to use and easy to exchange, either on one microscope or between different microscopes in the lab.

Available in four different fluorescence excitation/emission combinations, SFA is economical and expandable. Buy any excitation/emission filter combinations you need to start and expand at any time.

Excitation/ Filter application

"Violet" for CFP, Cerulean, ...

"Royal Blue" for GFP, eGFP, fluorescein, ...

"Cyan" for YFP, Venus, ...

"Green" for DsRed, dTomato, mCherry, ...

Excitation

400-415nm

440-460nm

490-515nm

510-540nm

Emission

460nm

500nm

550nm

600nm

A white light LED is also available.

For more information and to request a quotation visit www.nightsea.com/spectrum/.

NIGHTSEA products are distributed by Electron Microscopy Sciences
P: +1 (215) 412-8400 W: <http://bit.ly/ems-nightsea>

