

## The Crest

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Chesapeake Bay  
National Estuarine  
Research Reserve  
in Virginia

a fair Bay Spring  
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## Scientists Taking a New Look at Sources of Nitrogen in Estuaries

Ph.D. student Jason See is working with his advisor, Dr. Deborah Bronk, Department of Physical Sciences, on a discovery he calls the "humic shuttle." Humic substances are the dissolved organic compounds often give many rivers their characteristic tea color.

See's results are exciting because it means that he has discovered a new function for humics in the environment. These substances, which are defined by their extraction processes rather than their structure, make up 30 to 60% of the dissolved organic matter



Ph.D. student Jason See working on another piece of the nitrogen puzzle.

(DOM) and up to 90% of the dissolved organic carbon (DOC) found in the riverine environment. In the past, humics have been thought to be highly refractory, and therefore have little influence on environmental processes. Scientists believed that phytoplankton were unable to utilize nitrogen associated with humics until the humics had been broken down by bacteria. See's work appears to be changing that belief.

Scientists have recently shown that nitrogen (in the form of ammonium) can be released from sediments as the

salinity level in surrounding waters increases, probably due to binding to organic compounds including humic substances. This knowledge caused See to question whether salinity could also cause humics in the water column to release ammonium. If increased salinity causes the release of ammonium, then this could be happening in rivers as salinity rises from the head waters to the river's mouth. See believes that humics, formed upriver, are capable of binding ammonium and then releasing it down river where it could fuel phytoplankton growth.

See's initial lab results did not confirm his hypothesis,

however. In fact, no ammonium appeared to be released. "These results were discouraging. But, because I thought I was on to something, I began to question my testing methods," See explained. See and Bronk then theorized that the accepted humic extraction process was removing the ammonium, and developed an alternate method of isolating humics. The results were then as they expected: ammonium was released when salinity increased. See is currently looking at release rates of ammonium in the York River and the Satilla River in Georgia, as well as commercially available terrestrial humics.

With this discovery, which includes novel techniques, new questions have now arisen. Seasonal cycles, ammonium/humic concentration ratios, and differences in terrestrial humics and marine humics are all areas See is addressing in his dissertation. In addition to the discovery of an unrecognized form of inorganic nitrogen delivery via organics in river systems, scientists will also learn from the techniques utilized. Current published photochemical rates and the belief that humics are nitrogen poor will now be challenged due to the realization that the method for extracting humics was skewing test results. Dr. Bronk commented, "We can't say what the direct results of these findings will be, but it's one more piece of the puzzle."

*ChesSIE*

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and investigate various Bay species. Would you like a new lesson plan or classroom activity for your students? These are available for every grade level. How about real-time data? CBP/CIMS, CBOS and other online data products are accessible. ChesSIE also features a Bay education discussion list; links to Bay educational facilities: aquariums, museums, science centers, field schools; Bay science research centers and graduate programs; grants and awards available to Bay educators; state departments of education and jurisdictional information; professional organizations and event calendars: NMEA, MAMEA, NSTA; and information about CBP educational projects and partners.

So, if you're looking for a restoration project in your area, a summer program for your students, data from

your watershed, or fun facts about the Bay, be sure to check out ChesSIE at <http://www.bayeducation.net>. For

further information about ChesSIE, please contact Susanna Musick at [sxmusi@vims.edu](mailto:sxmusi@vims.edu).



From left- Marine educators Lisa Lawrence, Vicki Clark, Lee Larkin and Susanna Musick.