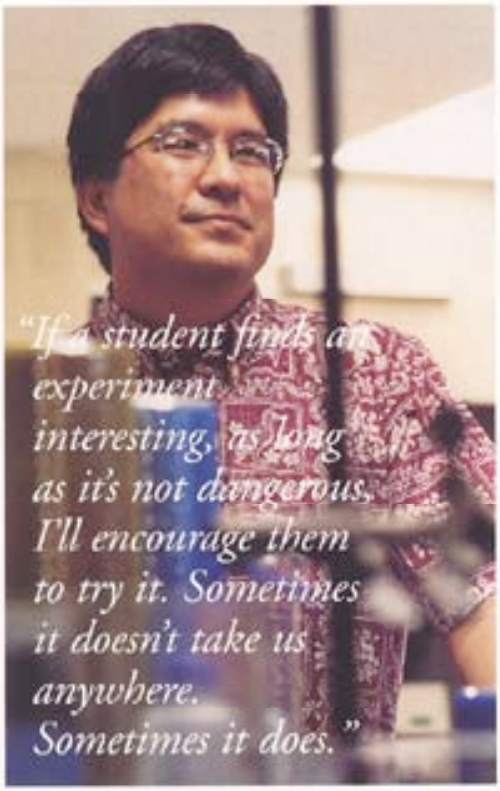
1. CAN we find new routes to prepare microporous manganese oxides in different chemical compositions and physical forms?



Manganese oxides are not discussed much outside the world of inorganic chemistry.

But for Steve Hughes '02 and Milse Marvel '03, the development of new, synthetic routes to microporous manganese oxides comprises the bulk of their research. Hughes and Marvel, both chemistry majors, work with Professor of Chemistry Stanton Ching in the creation of these substances with layered and tunneled structures. Manganese oxides have garnered significant attention due to their potential applications as toxic waste absorbents and electrode materials for rechargeable batteries.

While the compounds exist in nature, they are difficult to mine in pure forms. "It is much easier and less expensive to make them in the lab," explains Ching.

A member of the CC faculty for close to 12 years, Ching has a reputation for including students in his research. He publishes regularly in scientific journals such as *Chemistry of Materials* and *Inorganic Chemistry*, and students frequently earn co-authorship on his articles. "The students are right there in 'the trenches' with the faculty," he says. "It might take more of a professor's time, but that's what we do here.

"If a student finds an experiment interesting, as long as it's not dangerous, I'll encourage them to try it. Sometimes it doesn't take us anywhere. Sometimes it does." It is the unexpected results, says Ching that usually prove to be the most interesting.

Both Hughes and Marvel are grateful for the autonomy their mentor allows them in the lab. "We have a ton of freedom," says Marvel, "But Stan is there to help us along the way." The independent

FROM LEFT: STEVE HUGHES '02, PROFESSOR OF CHEMISTRY STAN CHING AND MIKE MARVEL '03 IN THE LAB.

nature of the work has allowed them to make some significant developments.

During his four years at the college, Hughes has found ways to prepare manganese oxides as thin films using a technique called non-aqueous, sol-gel processing. The thin films are useful for electronic applications. "Steve is very good at learning how to use the instruments in the lab — he picks that stuff right up," says Ching. In April, Hughes and Ching presented their research at the 223rd American Chemical Society National Meeting in Orlando.

Marvel also came upon a unique discovery. "I found a new way to make todorokite, which is a specific type of manganese oxide," he says. He makes a colloidal suspension, in which small particles are suspended in solution — "like chocolate syrup in milk" — and then spreads the liquid on a glass slide and treats it at a high temperature, forming the todorokite.

In the lab, Hughes and Marvel build on work done by former students, including Kathy Krukowski Kichtyka '99, Peter Driscoll '01 and Eric Welch '01.

"It's very much a team effort," says Ching. "Contributions are made over several years with several students."

The close bond forged by many hours in the lab is evident between Hughes, Marvel and Ching. Both students plan to go on to graduate school and eventually teach, like their professor. They also spend time together in recreational activities. Though Hughes admits he doesn't get out of the lab often – "I pretty much live here" – he managed to find time to introduce Ching to the art of kite flying on the seaside lawns of Harkness Memorial State Park in Waterford.

"The research we're doing here is very valuable," says Ching. "The students can make original contributions to science even as they learn the profession."

— Mary Howard