

## CHEMISTRY: AN INSPIRATION FOR THEATRE AND DANCE

**Zafra M. Lerman**

Institute for Science Education and Science Communication, Columbia College

Chicago, 600 South Michigan Avenue, Chicago, IL 60605-1996 USA.

E-mail: zafra@aol.com

Many efforts have been made to improve the public understanding of chemistry, but we do not see a change in the attitude toward chemistry by the general populace. Chemistry, chemicals and chemists are commonly viewed as causing many of the public problems, and we rarely hear the public or the media emphasizing the good that chemistry has brought to the world. A common sight is labels stating: "This food contains no chemicals;" because chemicals are viewed as "bad" in the mind of the public, which does not understand that everything is chemicals: the food they eat, the air they breathe, the clothes they wear – even they themselves. Chemicals are still viewed as the villain, and chemistry is perceived as a very hard subject to study. Despite the current public and media interest in gene therapy, cloning, the Genome, stem cells, new materials and new drugs, the public does not understand that the basis for this research is chemistry.

The arts can play a valuable role in reversing this public perception, and chemistry, in turn, can be a wonderful subject for the arts. For instance, in 1959, Tom Lehrer taught the public about the Periodic Table in his popular song "The Elements." Carl Djerassi and Nobel laureate Roald Hoffmann wrote the play "Oxygen," which has been performed in many places around the world. The famous dancer Liz Lerman finds science to be a rich source of material for her dance company to perform; she sees her dancers as helping disseminate scientific discoveries to the public, and helping the public visualize the scientific concepts. There is a current trend for dance companies to choreograph dances about the Genome Project and DNA. Nobel laureate John Polanyi has referred to molecular movement as "the dance of the molecules." Many scientific discoveries are often an inspiration for dancers, actors, playwrights, poets and musicians.

Drama, dance and music can be tremendously effective tools to communicate, teach, learn and assess chemistry. When students who major in art, music, dance, drama and poetry see that chemistry can be a subject which can help them excel in their major and, later, in their profession, they are happy to enroll in a chemistry class to get inspiration for their work. The chemical bond has become one of the most attractive subjects for drama and dance projects; by producing these pieces, the students not only learn the chemical concepts and retain this information longer than by traditional teaching methods, but the audience that views these projects also learns the basic chemistry concepts and enjoys it!

For example, those star-crossed lovers, sodium and chlorine, have been immortalized on videotape and DVD in a drama written, acted, and filmed by Columbia College theatre students, as a mock Shakespearean tragedy ala Romeo and Juliet, with apologies to W. Shakespeare ("For never was a story more dark and glum, than that of Chlorine and her Sodium").

The students cast Sodium in the role of Romeo, and Chlorine as Juliet. They become a couple (bonded) by Sodium giving his extra electron to Chlorine through a kiss, making her his "sweetest wife" and

forming salt (*figure 1*). The students wanted to follow Shakespeare's tragedy, thus Mendeleev enters the scene and orders the couple to go into water, which breaks their bond/marriage. The dramatic presentation ends with all actors holding placards stating "Learn to take every tragedy with a grain of ... SALT" with the couple appearing one final time together behind the word "SALT" (*figure 2*). The students (now graduates) who wrote and performed this play have reported that they recall this subject stronger than any other, because they internalized the subject when they wrote and acted the play.



figure 1

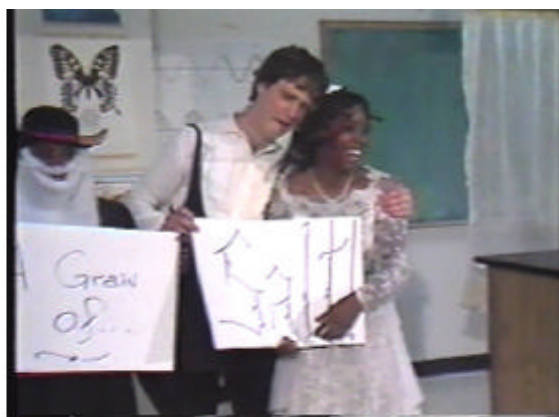


figure 2



figure 3

Another group of theatre students created and performed "The Bondfather" to discuss ionic and covalent bonds, following the storyline and music from the "Godfather" movie. In the dramatic presentation, a distraught mother beseeches Don Mendeleev (The Bondfather) for his help, explaining that her daughter, Chlorina, has fallen in love with Sodium and that, together, they have formed a crystal: ordinary table salt. She says that the chemists explained to her that it was just a matter of time before they were "sprinkled on someone's French fries or dissolved in water." She would instead prefer her daughter to have the same relationship as she has with her husband: a covalent bond -- they share electrons, and it is a strong relationship that cannot be easily broken (*figure 3*).



figure 4



figure 5



figure 6

The subject of the ionic bond was also choreographed as a dance, with the dancers representing from one side the metals Li, Na and K, and from the other side the halogens F, Cl and Br. The metals are forming ionic bonds with the halogens. The story behind the dance is a celebration of Chlorine's "Sweet Seventeen" party. When Sodium and Chlorine join together and perform a solo dance, a water molecule arrives and breaks up the couple. This dance was performed in many chemistry conferences, as well as other occasions in many states and cities. The accompanying illustrations (*figures 4, 5 and 6*) are from a performance in a 2001 Gordon Research Conference on Science Visualization, held in Mt. Holyoke, Massachusetts, USA. At the end of the dance, the audience jumped to its feet, with cries of "Bravo."

Also during the Gordon Research Conference on Science Visualization, a second dance was performed on "The Three States of Matter." In this dance, "Solid" dances on a stationary pedestal (*figure 7*), the "Liquid" dancer flows across the stage (*figure 8*), and the dancer representing "Gas" took up the space of the room, floating "just like a vapor" (*figure 9*). During the dance, a boy falls in love with Solid, but she melts and "through his fingers she runs." The boy next falls in love with Liquid, but as he draws closer, she evaporates. He then falls in love with Gas, but she also escapes him. Finally, they all return dancing together, and the boy realizes they are three different states of the same life (*figure 10*). A very important subject to communicate to the public is depletion of the ozone layer by chlorofluorocarbons

(CFCs). A beautiful dance on this subject was performed by a children's dance company which works with the Science Institute at Columbia College Chicago (*figure 11*).



figure 7

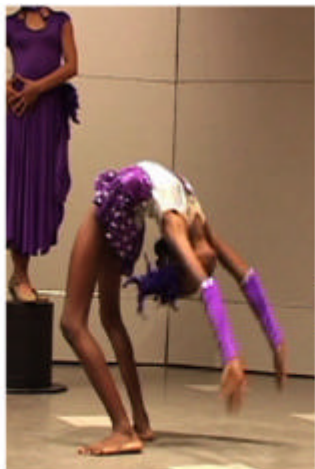


figure 8



figure 9



figure 10

In addition to performances in national and local scientific conferences, schools and to the general public, this dance was also featured by ABC, CNN, NBC and WGN television stations, as well as national television in China and South Africa.



figure 11

The depletion of the ozone layer is also represented in a show for children called “Ozone the Clown.” The clown (who has a “O” around one eye and a “3” around the other) explains to the children the ozone molecule ( $O_3$ ) by using three balloons (*figure 12*) and then continues to show the consequences to planet Earth caused by the hole in the ozone layer.

After each of these dance and drama performances, audience members reacted with the same enthusiastic statement: “Now I understand the concept!” Using theatre and dance to communicate chemistry can bring chemistry to places and cultures around the world which are very underprivileged and underrepresented in our profession.



figure 12

### References:

Djerassi, C. and Hoffmann, R.: Oxygen. Wiley-VCH: Weinheim, 2001.

Lehrer, T.: “The Songs By Tom Lehrer.” Rhino Records (reissued 1997).

Lerman, Z. M.: “Visualizing the Chemical Bond.” *Chemical Education Journal*, 5, (1), Special Issue on Pacificchem 2000; <http://ce.t.soka.ac.jp/cei/v2n1/ZLerman/index.html> (2001).

Lerman, Z. M.: “Using the Arts to Make Chemistry Accessible to Everybody.” *Journal of Chemical Education*. 80 (11), 1234-1243, 2003.

Lerman, Z.: “Chemistry for the People who will Shape our Future.” *Chemical Education Journal*, 4, 1, Special Issue on the 8ACC Symposium on Chemical Education; <http://chem.sci.utsunomiya-u.ac.jp/v4n1/lerman/header4.html>: 2000.