The Beagle Home

Adapt or Die

LAB RESOURCES

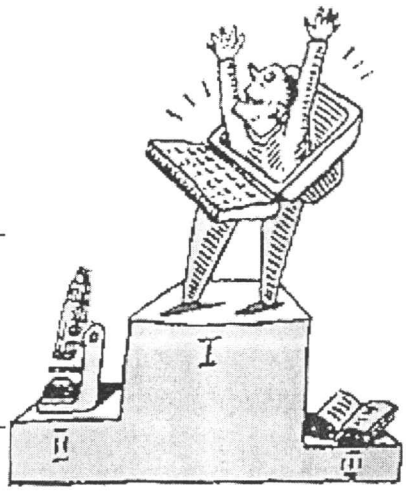
BACK TO Archives MAIN

Pictures of Life

Using Web Images to Teach Biology

by Malcolm Campbell

(*Posted April 1, 1999 · Issue 51*)



Abstract

Web renditions of biological material are a boon to teacher and student, offering advantages such as three-dimensionality and motion.

Teachers have long recognized the importance of visual information when describing biological concepts.

This may be the best era in which to teach biology since Robert Hooke first observed cells through a microscope. Perhaps more than any other scientific discipline, advances in biology have depended upon the visualization of processes and structures, such as the discovery of the Golgi body one hundred years ago, or the characterization of clathrin-coated pits. And teachers have long recognized the importance of visual information when describing biological concepts to students: we've used transparencies and slides in the classroom, and microscopes and dissections in the lab. Computers were a revolutionary new tool that teachers embraced. With the addition of the World Wide Web, educational resources increased exponentially, providing teachers with myriad new sources of information and new ways to help students comprehend biological processes.

Seeing Is Believing

Most students have trouble visualizing molecules as real, three-dimensional objects. To address this problem, I have used the huge searchable database of crystallographic structures and the data file that one can download from the Structure Group at the National Center for Biotechnology Information. RasMol and Cn3D are freeware programs that convert a data file into a model that can be viewed from many angles (figure 1); one can rotate the molecule in space, and zoom in or out for different perspectives (figure 2). These programs are useful in demonstrating molecular processes such as protein-protein interaction, and since many of the molecules studied in the classroom have been crystallized, the instructor can choose which molecules to emphasize with computer graphics.

Figure 1

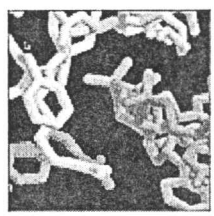


Figure 2

#0; 567&’065 2’4%’+8’ $+1.1); #5 016*+0) $76 &’#& %’..5 $’%#75’ 6*’ +/#)’5 6*’; 5’’ #4’ 757#..; ’+6*’4 56#6+6%:6$11- 2*161)4#2*5 14 1(%’..5 6*#6*#8’ $’’0 (+:’& 4#6*’46*#0 5*19+0) 6*’ &;0#/+% +06’4#%6+10(.+8+0)%’..5 7+%- +/’ /18+’5 75+0) 6+/’ .#25’ 2*161)4#2*; %#05*19 567&’065*19 %’..5 (70%6+10 #0& $’*#8’ 14’:#/.’ 4’%’06914- 76+.+<’&4’’0 (.714’5%’06 2416’+0#0& # /’6*1& %#..’& .714’5%’0%’ ’%18’4; (6’4 *161$.’#%*+0) 61 4’8’#. 6*’ &;0#/+% (.19 1(/1.’%7.’5 +06*’ ’0&12.#5/+% 4’6+%7.7/ #0& 1.)+ (+)74’ ! " *’5’ #0& 16*’4 57%*+/#)’5 #4’ 572’4$ +..7564#6+10(8’5+%7.#418’/’06 #0& 6*’ (.7+&/15#+% /1&’. 1(/’/$4#0’ 5647%674’ 016*’4 17656#0&+0) 7+%- +/’ /18+’ 5*195 # %#.%+7/9#8’ 59’’2+0) #%4153# (’46+.+<’& ’)) 9*+.’ 5+/7.6#0’175.; 5*19+0) 6*’ 8+6’..+0’’08’.12’ 4+5+0)&7’ 616*’ %146+%#. 4’#%6+10 3451%’55+5+/2155+$.’ 61 &4#9 2*161%12; 14 16*’49+5’ &’/10564#6’ (+ .74’

016*’4 /18+0) +/#)’ %#0$’ 241&7%’8&; . #0+/#6+10 0.+-’ 7+%- +/’ (+.’5 9*+%*%#0$’ 8’4; .#4)’ #0&/#; 6#-’ /+076’5 61 &190.1#& . #0+/#6+105 #4’ 5/#.. (+.’5 6*#6%#0+..7564#65+/2.’ /18’/’065 75+0) 6*’ 5#/’ /’6*1& #5 1.& (#5*+10’&(.+2$11-5 6;2+%#. #0+/#6+10 75’5 # 5’4+’51(&4#9+0)5 24’5’06’& +0 4#2+&57%%’55+10%4’#6+0)6*’ +..75+101(/18’/’06 6#511& 9#; 61+..7564#6’(14 ’:#/2.’ # /’6#$1.+% 2#6*9#; 14 6*’ ’0<;/#6+% %;%.’1(# 2416’+0 #0+/#6+10 %#0$’ %4’#6’&(41/ #0; 5’4+’51(2+%674’5+6* 6*’ #+&1((4’’9#4’ 57%*#5 +(7+.&’4

./156 ’8’4; /’&+%#. 5%*11.*#5 +65%1..’%6+10(*+561.1); 5.+&’510.+0’ 51 /’&+%#. 567&’065%#075%6*’/ (14 %.#55 6*’ ’$ #6* 4’5174%’1(6*’ 06’40’6 #6*1.1); #$14#614;(14 ’&+%#. &7%#6+10 +-’9+5’ 9*’0 &+5%7551+0)2#46+%7.#6+557’+0#0 70&’4)4#&7#6’%1745’ 567&’065%#0$’ &+4’%6’&16*’ #224124+#6’/’&+%#. 5%*11. ’$ 5+6’(14 6*’ 2’46+0’06+/#)’5 0%’ #66*’ #55+)0’&5+6’ 567&’0651(6’0 $’%1/’ ’0)4155’& #0&)’0’4#..; 6#-’ 6*’ 12214670+6;61 ’:2.14’ 4’.#6’&/#6’4+#. +0#&&+6+6016*#6 #55+)0’& +0%.#55

65 ’:2.14’ ’$ #6’4+ #55+)0/’065

0’ 4’5’#4%*#4’# 6*#6%*#0)’5 4#2+&.; #0& +5%18’4’&+0/#0; %1745’5 +5 ’9 6’:6$11-5 %#0247’5’06 #.. 6*#69’ *#8’ .’#40’& 4’%’06.; #$176 6*’ 41.’ %*’/1-+0’ 4’%’26145 2.#; +0 +0(’%6+104’5+56#0%’#0& 2155+$.’ 6*’4#2; 1 #&&4’55 6*’+5*146%1/+0) *#8’ #&&’&4’.#6’&6’:6 #0& 6+)74’5616*’ ’$ (14 567&’063+’9+0) *+5+5,756 10’ ’:#/2.’ 1(*19 8’4; 4’%’06(+0&+0)5%#0$’ 24’5’06’& 10 6*’ ’$ 6172&#6’1.&’4 +0(14/#6+10 6#.51 *’.25)’0’4#6’ ’:%+6’/’06 +0567&’065 9*’0 6*’; 4’#.+<’6*#66*+5+0(14/#6+10 +551 0’9 6*#6+6 *#50 66 #22’#4’& +06’:65

#0; $+1.1)+%#.241%’55’5#0&%10%’265#4’ &+((+%7.6 61’:2.#+0 9+6*1768+57#.#+&5 .+&’#0&18’4*’#& 241,’%6145*#8’ $’’0 6*’ 24’(’44’& 611.5 1($+1.1); 6’#%*’45(14 /#0; ;’#45 019 6*’ ’$ #..195 +05647%6165’:2.14’ 0’9 &+/’05+105 +08+57#. 24’5’06#6+105 ’ %#024’5’06 /#0’78’4#$.’ /1&’.5 1(/1.’%7.’5 9’ %#075’ /18+’5 #0& #0+/#6+105 61 1$5’48’ 6*’ 241)4’55 1(%1/2.’: 241%’55’518’4 6+/’ +561.1)+%#+/#)’5 *#8’ #.51 $41#&’0’& 6*’ 4#0)’ 1(+/#)’5 10’ %#024’5’06 61567&’065 #0; 6’#%*’45*#8’ 5.+&’.+$4#4+’5 1(014/#. 6+557’56#+0’8906* 64#&+6+10#+561.1)+%#56#+05(41/ 6*’ ’$ 9’ %#0#%37+4’ 52’%+#.+<’&/#)’5 57%*#5 +//701(.714’5%’0%’ #0&’.’%6410/+%41)4#2*5 6*#6%#0016$’ 8+’9’& 9+6* 64#&+6+10#&+# 746*’4/14’ 6*’ ’$ 2418+&’5567&’065)+6* #%%’56 16*’5’ &;0#/+% +/#)’5 #6#.. *1745 1(6*’ &#; 140+)*6 ’8’0 9*’0 6*’ +05647%61+5016 #8#+.#$.’

#8’ $’’0 75+0) 6*’ ’$ +0%.#55(14 691 ;’#45 #0&#8’ %1..’%6’&# 07/$’4 1(75’(7. 4’5174%’5 0’ 2#)’ (14’:#/.’ 2418+&’5.+0-5 614’.’8#06 7+%- +/’ /18+’5 #016*’4 .+565 #5 1. +/#)’5 70&’4*’#&+0)5 57%*#5 #0& 5 6’#%*’45&’8’.12 0’9 ’$ $#5’& 6’#%*+0)4’5174%’5 9’ 9+.. $’ #$.’ 61 76+.+<’174 %1/$+0’& ’((1465 61$7+.&# 5;0’4)+56+%%1..’%6+10(’:%+6+0)6’#%*+0)611.5 5 6+.’ 24+%1(%1/276’45)1’5 &190 #0&/14’ ’$ 51(69#4’ $’%1/’5 #8#+.#$.’ +0%4’#5+0) 07/$’45 1(6’#%*’459+.. $’ #$.’ 61&’5+)06*’+4190 8+57#.#+&510 6*’ ’$ *’ .+/+6+0) (#%6146*’0 +5%4’#6+8+6%0&+/#)+0#6+10 9*+%*6’#%*’45*#8’ 4’.+’&7210 5+0%$’(14’ 1$’46

Hooke.

A. Malcolm Campbell is an assistant professor of biology at Davidson College. He has made numerous presentations about teaching as an "alternative" career option, and has written How to Get a Teaching Job at a Primarily Undergraduate Institution.

Andrzej Krauze is an illustrator, poster maker, cartoonist, and painter who illustrates regularly for HMS Beagle, The Guardian, The Sunday Telegraph, Bookseller, *and* New Statesman.

E-mail this article to a friend

Tell us what you think.

Feedback

Endlinks

Beyond Bio 101: The Transformation of Undergraduate Biology Education - a report from the Howard Hughes Medical Institute includes an extensive collection of Web resources.

Cornell Theory Center Math/Science Gateway: Biology - links to resources in mathematics and science for educators and students in grades 9-12. Teachers of other levels may find these materials helpful.

The Biology Project - an online interactive resource for learning biology. From the University of Arizona.

Access Excellence - an excellent resource for biology teachers and students that contains online mysteries, interactive resources, lesson plans, and general information related to biology. Since the site is maintained by Genentech, it emphasizes genetics and biotechnology.

Biology Education Software Taskforce - publishes reviews of biology education software and provides links to software providers.

Previous Adapt or Die Articles

- Lab Judo: Defend Against Hostile Colleagues
  by Christopher G. Edwards (Posted March 19, 1999 · Issue 50)
- Proposal Preparation without Panic
  by Liane Reif-Lehrer (Posted March 5, 1999 · Issue 49)
- Anatomy of a Rejection: Improve your Publishing Record
  by Chris Edwards (Posted February 19, 1999 · Issue 48)
- One Enzyme Fits All
  by Malcolm Campbell (Posted February 5, 1999 · Issue 47)
- Meet the Press: But on Your Own Terms
  by Chris Edwards (Posted January 22, 1999 · Issue 46)
- Innovation: Making Ideas Work for Themselves
  by J. James Cotter (Posted January 8, 1999 · Issue 45)

more
