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SMR.648 - 12

SECOND AUTUMN WORKSHOP ON MATHEMATICAL ECOLOGY

(2 - 20 November 1992)

"Software for Teaching and Doing Research in Ecology"

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These are preliminary lecture notes, intended only for distribution to participants.

LISTING OF SOFTWARE (7/92)
QUANTITATIVE CURRICULUM FOR LIFE SCIENCE STUDENTS[1]

CALCULUS

Alstad,Don; Curtsinger,Jim; Abrams,Peter; Tilman,Dave (1991): POPULUS. (University of Minnesota)
[CALCULUS, COMPETITION, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, LINEAR ALGEBRA, MODELING, MULTIPLE POPULATIONS, POPULATION, PREDATOR PREY, SINGLE POPULATION,DOS]

<This program is easy to use and could prove to be very helpful. The organization of the software allows students with very little background in computers to use it very easily. The user has easy access to different parts of the program which allows him to access the specific area he is interested in. The program in general gives could explanations about each area and offers informative background material about each aspect of the program. The graphs are very descriptive and are easily understood. The program does a very good job of labeling the graphs and demonstrating the equations. The graphs involved in the four-species interaction section are very advanced and impressive. There was very few disadvantages to using this software. A few times I found myself confused about what each variable was representing. In some sections variables were easily identifiable but in others it was confusing. However, as a whole the program was very friendly, and it does a very good job of relating mathematics to ecology. (REVIEW 2: RATING = 8) Overall this is a very good program for ecological simulations, evolutionary simulations and hybrid simulations. It has very nice 3D graphing ability. It can be used by undergraduate students, graduate students and professors to simulate the models that they have. Limitations in the program are: 1) there is no way of saving a graph, data or parameters for a certain model so it can be used in the future, 2) the system can only contain a maximum of four DEs. It could be improved by 1) adding available the two commands CONTROL QUIDED TOUR and MENU GUIDED TOUR that are available in the package ACID BASE SIMULATION, 2) adding an option of rotating axis in graphs see the MODELS package, 3) adding an option to define the system iteratively as an example xprime(i)=fun(i), and (4 adding a much higher limit of the number of equations in the system. (REVIEW 1: RATING = 8)
Refer to review in THE QUARTERLY REVIEW OF BIOLOGY volume 67, no. 2, June 1992 pages 251-252.>

Holden,Herbert L : Solve1. (Mathematics Department Gonzaga University Spokane, Washington 99259)
[CALCULUS, LINEAR ALGEBRA,DOS]
<for review refer to AMS Notices September 1990 volume 37 page 868>

Huseyin Kocak (1989): Phaser. (Differential and Difference Equations through Computer Experiments, Springer-Verlag)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING, MULTIPLE POPULATIONS, PHASEPLANE, POPULATION SINGLE POPULATION,DOS]

<The software had great graphing capabilities, but required the use of a handbook in order to use. The program would be ideal to use with a class in differential equations. The program allows the user to visualize equations in up to four dimensions. The way that the program will rotate projections as well as demonstrate different views makes it easy to visualize actual problems. The program is outstanding in its graphing capabilities, however, it is hard to use

[1]Supported by NSF Grant USE-9150354 to University of Tennessee

these assets without the help of the handbook. To a naive user, it would be difficult to access the program and begin graphing. Also, there is very little explanations available as to the what exactly the software is doing. However, if the person using the software has some computer knowledge and access to the handbook, this software would certainly increase their visualization of differential and difference equations. (REVIEW 2: RATING = 6)
For another review see AMS Notices April 1990 volume 37 page 430.>

Industrial Computation Inc. (1987): PowerMath II. (Central Products Corportation 2211 Norfolk Suite 518 Houston, TX 77098)
[CALCULUS, SYMBOLIC ALGEBRA,MAC]
<for review refer to AMS Notices November 1989 volume 36 page 1204>

John H. Hubbard; West,Beverly H (1992): MacMath. (MacMath, Springer-Verlag)
[CALCULUS, COMPETITION, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, LINEAR ALGEBRA, MODELING, MULTIPLE POPULATIONS, PHASEPLANE, POPULATION, PREDATOR PREY, SINGLE POPULATION,MAC]
<The software was designed to supplement a junior or senior level class in differential equations. I, as a junior, found the software easy to work with and easy to understand. It is very useful as a tool to graph differential equations in two or three dimensional space. When I used the software with the manual, I was able to create really neat examples. What I liked about the program is that it is very versitile. The fact that it combines several programs in one would make it a useful tool that could be used for various classes as an undergraduate. In my opinion, this software would definitely be very helpful and easy to use for an undergraduate. (REVIEW 2: RATING = 8)
This software can only be used for class demos and for undergraduates in general. It has several separate programs which are analyzer which graphs a general function and finds its roots, differential equations which have two and three dimensional aspects with phase planes, a demo for bifurcation, an eigenvalue and eigenvector solver program, a numerical methods

program for solving differential equations (Runge Kutta, Euler, Midpoint Euler), Fourier approximation for any given function, and others which are not important for our discussion. Because this is a Mac program, it is very simple to use, because everything but input of data can be done with the mouse. The thing I liked best was its eigenfinder program. This program gives the output in a very nice mathematical manner, however, it is limited to twelve by twelve matrices. In the phase plane program, you can start the trajectory any place you want on the screen by pointing the cursor and clicking the mouse. This aspect is a time saving device, because the user doesn't have to plug in initial conditions. The three dimensional graphics were not very good. However, it serves the purpose in which it was intended. (REVIEW 1: RATING = 8)>

Kemeny,John G; Kurtz,Thomas E (1989): Calculus 3.0. (Dartmouth College)
[CALCULUS,DOS,MAC]
<for review refer to AMS Notices February 1990 volume 37 page 129>

Lapidus,Martin (1990): Models. (Lascaux Graphics 7601 N. Calle Sin Envidia #31 Tuscon, AZ 85718)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING, MULTIPLE POPULATIONS, POPULATION,

SINGLE POPULATION,DOS,MAC]

<A very nice software for solving difference and differential equations. I found it to be very fast in fact I have tried it on a difference equation that was implemented first on Mathematica (not in the most effecient way), but Models was much faster and easy to implement. We got to see the two and three dimensional graphics easily, nicely, and we had the option to zoom in and out on any part of the graph. I liked the ability of being able to rotate the axes and the fact that it is able to solve a large system of equations unlike populus which could handle a maximum of four equations. This software also allows you to set the step size for integrating the ODE which is something that comes in handy when you know some information about the ODE you are modeling. One disadvantage is that if you have a large system of ODEs that can be defined iteratively using a DO LOOP then it would be tedious to use models, because you must enter each equation separately. In my opinion, this was one of the best software I played with (for DE). I recommend this very much for junior or senior level students, graduate students, and professional people. (REVIEW 1: RATING = 9) The program is a very good tool to help students visualize difference and differential equations. The software overall was farely simple to use and would require very little knowledge of computers. The only problem I had with the package is that it was difficult to use without a mouse. When a used it on a computer in which I could use the keyboard only, I found it difficult to figure out how to do diffirent things. However, when the mouse was available, the program was easy to use, and I enjoyed using it. In my opinion, Models is a very easy to use software which would certainly be useful to students in at any level who are dealing with difference and differential equations. (REVIEW 2: RATING = 9)>

MathCalcEduc : MicroCalc 4.0. (1449 Covington Drive Ann Arbor MI 48103)

[CALCULUS,DOS]

<for review refer to AMS Notices July/August volume 36 page 680>

MIT (1982): PC-Macsyma. (Symbolics Inc. Computer Aided Mathematics Group 8 New England Executive Park East Burlington MA 01803)

[CALCULUS, SYMBOLIC ALGEBRA,DOS]

<for review refer to AMS Notices January 1990 volume 37 page 11>

Odell,Garrett M; Segel,Lee A (1987): Biograph. (Cambridge New York New Rochelle Melbourne Sydney)

[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING,DOS]

<Biograph is an interactive program that computes numerically, then graphs solutions to systems of ordinary differential equations (ODE's) and difference equations. The program is capable of solving systems of n simultaneous DE's or difference equations. Biograph is a menu driven program, but the menus are a little hard to understand. For example, when you are in a menu other than the main menu you have no way of knowing that the command F10 will return you back to the main menu. Also, the graphics are not very sophisticated. For example, the axes are not marked by the variable they represent. Also, there is great difficulty in creating your own file, I wasted a lot of time trying to create my own model and was unable to do so. (This program is not at all user friendly!) However, other than that I think that the program is good, and it has a lot of options such as saving data to a file, retreiving data previously saved, output data, changing parameters in already existing models, changing initial conditions, or determining the limits of the axes for a graph. You can also determine equilibrium points, get a phase plane, and graph every variable versus time axis. (REVIEW 1:RATING=7)

This software was very hard to use. To begin with, the descriptions on the main menu are not very explanative. I had a hard time relating what I wanted to do with the choices represented on the menu. I even looked at the user manual and it was very little help to me. For example, when you are in one of the submenus and press 'q' to quit, it does not return you to the main menu, instead it returns you to a black screen with no indication where the cursor is. This was confusing to me, and I had to randomly press keys until I found out that you press enter in order to make the main menu appear. When I retrieved a document and had the program graph it for me, I did like the all the information available about the graph, but I thought the graph itself looked plain compared to software I have already used. In my opinion, this software would be frustrating for a naive user to work with. When compared to models or phaser, this software is easily the most difficult to execute and work with. The program itself would be good to solve differential and difference equations, because it provides the user with great options in order to examine the graphs and solutions of the problems. However, it requires a great deal of time in order to be able to execute the program successfully. (REVIEW 2: RATING = 6) For review refer to THE QUARTERLY REVIEW OF BIOLOGY December 1990 volume 65 page 539.>

Paracomp : Milo.
[CALCULUS, SYMBOLIC ALGEBRA,MAC]
<for review refer to AMS Notices October 1989 volume 36 pages 987-995>

PC Scientist Inc. : Sparsgem. (6 Pine Tree Drive Suite 250 St. Paul MN 55112)
[CALCULUS, LINEAR ALGEBRA,DOS]
<for review refer to AMS Notices October 1990 volume 8 page 1023>

Pinkham,Henry : DEGraph. (Columbia University)
[CALCULUS, DIFFERENTIAL EQUATIONS]
<for review refer to AMS Notices April 1990 volume 37 page 422>

Rich A.; Stoutmeyer D. (1988): Derive. (Soft Warehouse, Inc. 3615 Harding Avenue, Suite 505, Honolulu, Hawaii, 96816)
[ALGEBRA, CALCULUS, SYMBOLIC ALGEBRA,DOS]
<For review refer to ETH February 1991 page 5. For review refer to AMS Notices March 1990 volume 37 page 275>

Richard B. Anderson (1988): MathCAD. (Addison-Wesly Publishing Company, Inc.)
[ALGEBRA, CALCULUS,DOS,MAC]
<For review of the Macintosh version see AMS Notices January 1990 volume 37 page 15. For the PC version see AMS Notices September 1988 volume 35 page 978.>

Scientific Inc. : MiniPack-Lib. (6 Pine Tree Drive Suite 250 St. Paul MN 55112 (612)490-0615(phone))
[CALCULUS,DOS]
<for review refer to AMS Notices April 1989 volume 36 page 397>

Unisearch Limited : MathCalc. (PO Box 1 Kensington, NSW 2033 Australia)
[CALCULUS,DOS]
<for review refer to AMS Notices July/August 1989 volume 36 page 678>

Watrobsky,Denise : RMT- A Matrix Algebra Software Package.

(Saunders College Publishing The Curtiss Center Independence Square West Philadelphia, PA 19106-3399)
[CALCULUS, LINEAR ALGEBRA]
<For review refer to AMS Notices October 1991 volume 38 page 904>

Wolfram Research: Mathematica. (Wolfram Research, inc. 100 trade center drive, champaign, illinois 61820-7237, telephone 217-398-0700, email:info.wri.com.)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, LINEAR ALGEBRA, MODELING,MAC,DOS]
<For review see Notices of American Mathematical society volume 39 number 5 page 428.>

Chariot Software Group (1988): Math 1. (CSG Pub Domaine/ SW library)
[ALGEBRA,MAC]
<I played with this software for over an hour. It has a lot of options it they were to work. The things that work correctly are the 2-D graphs, the fractal, the Mac Lin 1.0, and the tangent options. I managed to crash the 3-D graphs several times on different easy functions like z= x**2 + y**2 for example. I managed to crash the conformal maps option, and I was unaware of what I did to make the program crash. In other words, the program is in good need of a lot of fixing and modifications. (REVIEW 1: RATING=2)>

Chariot Software Group (1988): Math 2. (CSG Pub Domaine/ SW library)
[ALGEBRA,MAC]
<A simple program. The option MathMaster is designed to solve first year algebra problems. It has an equation editor to create integral summations, fractions square roots and matrices. It has a number investigator that gives information on integers up to twelve digits such as prime factors, hexadecimal equivalents, and binary equivalents. Scientist's helper is data analysis / graphing program. Simple graphing, data reduction, multiple regressions, filering, Fourier transform, etc. (REVIEW 1: RATING = 2)>

Lascaux Graphics : f(z). (3220 Stuben Ave. Bronx, NY 10467 212-654-7429 (phone))
[COMPLEX ANALYSIS,DOS]
<for review refer to AMS Notices July/August 1989 volume 36 page 676>

Press,William H; Flannery,Brian P; Teukolsky,Saul A; Vetterling,William T (1988): Numerical Recipes. (Cambridge University Pres, Cambridge and New York)
[NUMERICAL ANALYSIS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY March 1989 volume 64 page 115.>

Levitin,Victor (1990): TraX: Simulation and Analysis of Dynamical Systems. (Exeter Software, Setauket, NY)
[CALCULUS,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY June 1991 volume 66 page 242>

MODELING

Alstad,Don; Curtsinger,Jim; Abrams,Peter; Tilman,Dave (1991): POPULUS. (University of Minnesota)
[CALCULUS, COMPETITION, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, LINEAR ALGEBRA, MODELING, MULTIPLE POPULATIONS, POPULATION, PREDATOR PREY, SINGLE POPULATION,DOS]

Berryman,Alan A; Millstein,Jeffrey A (1988): Population Analysis System (POPSYS). (Ecological Systems Analysis, Pullman, Washington)
[ECOLOGY, MODELING, SINGLE POPULATION,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY March 1990 volume 65 page 130>

High Performance System, Inc. : Stella.
[ECOLOGY, MODELING,MAC]
<For review refer to AMS Notices April 1990 volume 37 page 422 . Also, Robert Muetzelfeldt posted to ECOLOG-L@UMDD.BITNET a review in which he said, "Stella is inappropriate for ecological modeling at the research level." He also gave reasons and points supporting this statement.>

Ferson,Scott; Akcakaya,Resit H (1990): RAMAS / SPACE. (Applied Biomathematics 100 North Country Road Setauket Ny 11733)
[ECOLOGY, MODELING, MULTIPLE POPULATIONS, POPULATION,DOS]
<The software allows the user to analyze multiple population models. It is a good way to simulate the future of a particular species. However, the software cannot be used without prior knowledge of the subject matter. Refer to review in THE QUARTERLY REVIEW OF BIOLOGY volume 67, No. 2, June 1992 pages 252- 253>

Huseyin Kocak (1989): Phaser. (Differential and Difference Equations through Computer Experiments, Springer-Verlag)
[CALCULUS,DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING, MULTIPLE POPULATIONS, PHASEPLANE, POPULATION, SINGLE POPULATION,DOS]

John H. Hubbard; West,Beverly H (1992): MacMath. (MacMath, Springer-Verlag)
[CALCULUS, COMPETITION, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, LINEAR ALGEBRA, MODELING, MULTIPLE POPULATIONS, PHASEPLANE, POPULATION, PREDATOR PREY, SINGLE POPULATION,MAC]

Lapidus,Martin (1990): Models. (Lascaux Graphics 7601 N. Calle Sin Envidia #31 Tuscon, AZ 85718)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING, MULTIPLE POPULATIONS, POPULATION, SINGLE POPULATION,DOS,MAC]

Odell,Garrett M; Segel,Lee A (1987): Biograph. (Cambridge New York New Rochelle Melbourne Sydney)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS,

ECOLOGY, MODELING,DOS]

Reiners,William; Glanz,William; Cornish,Stanley (1973): Ecological Modeling. (CONDUIT, Iowa City)
[ECOLOGY, MODELING,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY December 1989 volume 64 page 542>

Scott Ferson (1991): RAMAS / STAGE. (Applied Biomathematics 100 North Country Road Setauket, NY 11733)
[ECOLOGY, MODELING, POPULATION, SINGLE POPULATION,DOS]
<This software allows the user to analyze a single population. As in the age-structured software, this program would come in handy to the ecologist or biologist that had a specific problem in mind. I liked the fact that the program allows the user to adjust various aspects of the information in order to see what affect different data has on the species. I also like the fact that you can view the matrices with the variables labeled. The graphs were easy to understand and related the data in an easy to read manner. The problems I had with the program were that I could not use it without looking in the manual to understand the functions of the main menu.>

Scott Ferson; H. Resit Akcakaya (1991): RAMAS / AGE. (Applied Biomathematics 100 North Country Road Setauket, NY 11733)
[ECOLOGY, MODELING, POPULATION, SINGLE POPULATION,DOS]
<The software serves a very specific purpose. The purpose of the program is to model a single population based on various factors that affect the population's growth and development. If this is the sole purpose of the user then the software would come in handy, and the graphs would prove helpful in demonstrating the relationship between various factors and each age group. If someone had a lot of information about a single species, the software would be useful in relating the information. The problems I had with the program are it could not be used easily without a manual, it is not very practical to use to simulate arbitrary situations, and it is not very informative. In my opinion the program would only prove to be useful if the user has knowledge of age-structured population dynamics and wants to relate information on a specific example.>

Wolfram Research : Mathematica. (Wolfram Research, Inc. 100 Trade Center Drive, Champaign, Illinois 61820-7237, telephone 217-398-0700, email:info.wri.com.)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, LINEAR ALGEBRA, MODELING,DOS,MAC]

ECOLOGY

Alstad,Don; Curtsinger,Jim; Abrams,Peter; Tilman,Dave (1991): POPULUS. (University of Minnesota)
[CALCULUS, COMPETITION, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, LINEAR ALGEBRA, MODELING, MULTIPLE POPULATIONS, POPULATION, PREDATOR PREY, SINGLE POPULATION,DOS]

Berryman,Alan A; Millstein,Jeffrey A (1988): Population

Analysis System (POPSYS). (Ecological Systems Analysis, Pullman, Washington)
[ECOLOGY, MODELING, SINGLE POPULATION,DOS]

Boothby,R; Buongiorno,J (1986): UNEVEN. (Wisc-Ware)
[ECOLOGY,DOS]

<This program's purpose is to help predict how a particular uneven aged stand will develop under various assumptions regarding how and when the stand is cut. It can help to determine the best management regime for a particular stand given a purely economic objective, wether the stand is part of a regulated system or a single entity. It is useful for managers who have non-economic objectives as well. The program is very simple to use and you don't have to enter a lot of data. You can choose various options yourself for example, your own growth model that fits the forest you are dealing with. .HELP command is available and provides good information. You can get a print out of every report, data table you want and you can save your output to a file. (REVIEW 1: RATING = 7.5)

This program was really easy to use. At the beginning, it provides the user with very basic information of how to get help and how to end the program. I thought this was very useful and made the program able to be used without consulting a manual. The program itself provides the user with choices and, the user enters data as the computer ask questions. I thought this type of format made the program very user friendly, and the user would have a hard time messing up a model. I liked the way that the user can create a new model or simply plug in information and use an existing model. The program did a really good job of explaining what variables meant, and even someone without knowledge of tree populations could understand the graphs and tables. There are several options available for the output. The only problem I had with the program is that there is no way to easily access files that have already been created. The user must exit the program and run a directory in order to see what data files are available. I would have liked to been able to see the data files that have been previously saved and choose which one I want to run. Overall, I think this program would be really useful to someone who is trying to manage land and trees. It provides the user with good information and predictions about what the trees are worth and the probability of their survival, and it is so user friendly that almost anyone could use it. (REVIEW 2: RATING = 8)>

Chariot Software Group (1988): Ecology Stack, Geology Stack, Science Stack. (CSG Pub Domaine/ SW Library)
[ECOLOGY, GEOLOGY,MAC]

<Ecology Stack: This software is nothing but a tutorial disk that presents ecological questions and topics on related talks, maps, etc.

Geology Stack: Again this is a geological tutorial on projections of maps etc.

Science Stack: It contains a demo of Macrograde a software that is used by instructors to keep records of students' grades etc. It also contains nice Astronomy slides and a demo of the software Physics test. It is only a tutorial. (REVIEW 1: RATING = 2)>

High Performance System, Inc.: Stella.
[ECOLOGY, MODELING,MAC]

EckBlad,J (1986): Ecological Analysis. (Oakleaf Systems, Decorah, Iowa)
[ECOLOGY,DOS]

<For review refer to THE QUARTERLY REVIEW OF BIOLOGY June 1989 volume 64 page 250>

Etter,Ron; Maddison,David (1992): Population Dynamics. [BIOLOGY, ECOLOGY, MULTIPLE POPULATIONS, POPULATION, SINGLE POPULATION,MAC]

<This program seemed to by designed to demonstrate the graphs of population dynamics. The program does not allow the user to plug in equations of his own, it simply allows the user to adjust constants. To me, this type of program would be useless, unless a student wanted to see the graph of general logistic, exponential, predator-prey or competition equations and even then it would become useless, because once you've seen the equation there is nothing really else to see. The graphs were "cute" and it was really easy to change the parameters so it is a very user friendly program. Other options in the program include looking at different models in three dimensions. This part of the program again showed really colorful and pretty graphs, but the graphs lacked explanation. It was really easy to rotate the axis of the graphs, but you cannot rotate the graph itself when you rotate the axis. Instead, the current graph is automatically erased and the user must redraw it. To me, it was difficult to visualize the graph because it did not rotate when the axis did. Also, the program has a group of files that you can look at. These include great pictures that people obviously have created, but again there is no explanation or equations that the user can relate these graphs. Instead, they just seem to be nice pictures. In my opinion, this program has very little to offer students, unless they just want to see demonstrations of general population dynamics equations. (REVIEW 2: RATING = 4)

This software is designed for demonstration purposes in class. One of the things I enjoyed very much is that in the competition model, the user is able to move the isoclines anyway he wants which allows him to change the parameters and thus changing equilibrium and then it allows you to see the phaseplane of the two species. However, it is limited in the sense that it has only four models exponential, logistic, Lotkavolterra predator-prey and competition models. One thing I did not like about the program is that it does not allow you to edit or enter equations. It has a nice chaos demo of predation and competion three dimensional model. The graphics are nice. It is very good software for somebody who has a course in differential equations (sophomore or junior level). (REVIEW 1: RATING = 7)>

Exeter Software (1990): Ecological Computer Games. (100 North Country Rd. Setauket, NY)

[COMPETITION, ECOLOGY, MULTIPLE POPULATIONS, PREDATOR PREY, SINGLE POPULATION,DOS]

<The games can be a good lesson for students. They can explain how one can choose a strategy in order for the species in a predator-prey system to survive. (For example, the fox and rabbit game.) In the Hawk, Weasel and Mice game the speed of the opponent was always faster which made it difficult for me to win or make the three species survive. It was frustrating. The same with the Rabit and Fox game. However, I liked the trout game the most. I was able to crash the species or make the species grow logistically. It seemed to me that the best strategy for this game is to stay on the surface and eat only insects. A nice thing about the three games are the graphs that show the change of each species with time. (REVIEW 1: RATING = 7) This software teaches you about populations while also allowing you to participate in a game. I think the fact that the user can play a game makes it more appealing to use. The trout game was fun, but the other ones made it very difficult to win, because the prey and the opponents move a lot faster than the predator that is being manipulated by the user. The program was really user friendly and easy to use. It also offered good explanations for what was happening and graphs. The only

things I did not like about the program was that once you start the program you cannot quit without playing a round, nor can you change the speed of the participants without quiting the program and starting it over. In general, I think that the program can teach a student about how populatons crash or thrive based on energy and food consumption while making it into a game. (REVIEW 2: RATING = 7)>

Ferson,Scott; Akcakaya,Resit H (1990): RAMAS / SPACE. (Applied Biomathematics 100 North Country Road Setauket Ny 11733)
[ECOLOGY, MODELING, MULTIPLE POPULATIONS, POPULATION,DOS]

Kreitzer,GP; Borisyuk,RM (1989): Catching Fish. (Applied Biomathematics)
[ECOLOGY, SINGLE POPULATION,DOS]
<This is a game of catching fish. Each game consist of ten seasons of fishing and you can adjust the intensity of fishing at the start of each season. One set consist of five games, but you can extend it to ten games. You can view previous games within a set by selecting the "View Game" function. You also have the option of saving any interesting game on a disk. You can restore them, as well as the relevant parameters, and continue the game with these parameters. For saving, loading and deleting select the "File" function. However, you can only save this information for one session- you lose all information if you quit the session. If you overfished and caused the abundance to fall below the critical value, the prompt "Poor fish!" is displayed and the score will be negative (i.e. you doomed the population to die out). A simple easy game to understand but in my opinion it fits more students that are in high school. (REVIEW 1: RATING = 7)

This program teaches the user the impact of fishing on the fish population, by making it a game the user can play. The software was really user friendly and commands were easily accessible. The user can simply move to the command he wants with the arrow keys and indicate this command by hitting enter. I liked the way that the graph appeared as you were playing. The only problem I had with the game is that there is no way to save information from one use to another. In my opinion, this software could be used by anyone, and could prove informative if someone wanted to learn the effects of fishing on a fish population. (REVIEW 2: RATING = 7)>

Lapidus,Martin (1990): Models. (Lascaux Graphics 7601 N. Calle Sin Envidia #31 Tuscon, AZ 85718)
[CALCULUS, DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING, MULTIPLE POPULATIONS, POPULATION, SINGLE POPULATION,DOS,MAC]

Levitan,Herbert (1988): LOGISTIC. (Wisc-Ware)
[BIOLOGY, ECOLOGY, SINGLE POPULATION,DOS-WINDOWS]
<This program is based on the simple logistic differential equation. It is a very easy program to use with windows (which have nice graphics) and a mouse. It gives you the option to change I.C. and other parameter values in the equation. There is no print out option, but there is nothing much to print since all you have is one window which is half data and the other half is for plotting the data. However, the software serves the objectives of the author. One of these objectives is to encourage students to use computer simulations as a tool

for learning. I think that this objective is met because of the simplicity of using this program. Hopefully students will be encouraged to use other simulation programs that may be more involved after using this one. The program has an example of the discrete logistic chaos graph that students may be interested in seeing and also students can input data that makes a population go extinct. Overall this is not a very complicated program, however, the author does mention that it is based on simple logistic equation. (REVIEW 1: RATING = 6)

The logistic software is very simple to use. The fact that it is used with windows makes options easily accessible, and also makes everything easy to see. The program itself is real simple and is easily understood. I liked the fact that it is very easy to change data, and if you plot one set of data you can leave it on the screen and compare it with the next group of data you enter and plot. However, in general the software seemed very simple and limited in its applications. In my opinion, the program would be easy for anyone to use, but would be of little use to someone because it is limited in what it does. (REVIEW 2: RATING = 4)>

Lopez,Gary; Rowlett,Brian (1989): Survival of the Fittest. (Education Materials & Equipment, Danbury, Conn.)
[BIOLOGY, ECOLOGY, PREDATOR PREY,MAC]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY September 1990 volume 65 page 395>

Odell,Garrett M; Segel,Lee A (1987): Biograph. (Cambridge University Press , NY)
[CALCULUS DIFFERENCE EQUATIONS, DIFFERENTIAL EQUATIONS, ECOLOGY, MODELING,DOS]

Reiners,William; Glanz,William; Cornish,Stanley (1973): Ecological Modeling. (CONDUIT, Iowa City)
[ECOLOGY, MODELING,DOS]

Salmon,I (1986): MicroModeller. (IRL Press (Oxford University Press), Oxford)
[ECOLOGY, POPULATION,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY March 1990 volume 65 page 131>

Scott Ferson (1991): RAMAS / STAGE. (Applied Biomathematics 100 North Country Road Setauket, NY 11733)
[ECOLOGY, MODELING, POPULATION, SINGLE POPULATION,DOS]

Scott Ferson; H. Resit Akcakaya (1991): RAMAS / AGE. (Applied Biomathematics 100 North Country Road Setauket, NY 11733)
[ECOLOGY, MODELING, POPULATION, SINGLE POPULATION,DOS]

Wilkinson,HT; Pederson,WL; Pondy,K (1989): Plant Root Model. (Wisc-Ware)
[BIOLOGY, ECOLOGY, PHYSIOLOGY,DOS]

<A very simple program that has only two screens- one for changing data and the other is a screen for the graph of the volume of the rhizosphere where you can see it in three different directions (upper, side, skew). In the data screen you can change the biology and the edaphic factors in the soil which in turn changes the max distance that the fungus can grow to the root and infect. (REVIEW 1: RATING = 1) This program is very simple and is very specific. In order to use this software, the user would have to want to observe a rhizosphere otherwise the program would be useless. I did not like the fact that it simply showed you a sphere around a root with no reference to distance or why it gets smaller if you change certain factors and larger if you change others. Even if the user changes the influence, there are very limited possibilities, thus making the software useless after all combinations of influences have been observed. The only thing I liked about the program was that it had a good explanation about what rhizospheres were, and it was simple to use with windows. In my opinion,the software would not be beneficial to students. (REVIEW 2: RATING = 1)>

GENETICS

Calley,John; Collins,Angelo; Jungck,John (1990): Genetics Construction Kit; A project BioQUEST simulation. (Annenberg Foundation/Corporation for Public Broadcasting Foundation for Microbiology)
[BIOLOGY, GENETICS,MAC]

<This program is very good at allowing the user to cross organisms in order to determine the inheritance patterns of a particular trait. The program did a good job of allowing the user to decide how to cross organisms. For example, the user can decide wether to cross two organisms which have the same genetic make up or cross two random organisms. Also, the program keeps track of which crosses have been made and in which vial these are stored. This aspect of the program is real handy, because it helps the user keep track of what he has done while at the same time helping him locate previous crosses. Another aspect of the program that made it easy to use was the fact that the program counts for the user, and the user is able to decide if he wants to see the total number of organisms with a certain trait or if he wants to see the number of each sex with a certain trait. I also found the data to be realistic, because on some simulations it took a couple of crosses before any conclusion could be made about the organisms inheritance. This is very similar to what could occur in a real lab. There was only one thing I thought the program should have included. That is I think it should display ratios. Since the program counts and classifies each generation, I think it should also demonstrate a ratio. It certainly would help the student decide what alleles are present. However, in general I think the program is a good simulation of a real lab where students start with organisms they know very little about and try to draw conclusions about their inheritance by crossing them. In fact this may be better than doing the real lab, because it allows the student to cross organisms and get results in a fraction of the time. (REVIEW 2: RATING= 8) (REVIEW 1: RATING = 8)>

Calley,John; Jungck,John (1990): Microbial Genetics Construction Kit (BIOQUEST Software). (Annenberg Foundation/ Corporation for Public Broadcasting)
[BIOLOGY, GENETICS,MAC]

<This program was designed to allow students to perform experiments with bacteria in order to simulate experiments that might be performed in a real lab. The software begins by giving the user a main menu. Here the user can choose one of five options: Serial Dilution Tour (which is designed to allow the student determine the number of bacteria in a random sample), Phenotype Identification Tour (which allows the user to determine the phenotype of the bacteria based on

replication), Complementation Tour (which allows the user to perform experiments to decide if two organisms that need the same nutrient to grow can benefit each other), Conjugation Tour (which allows the user to conjugate a colony) and Full Menu (which includes all of the options above). This menu is in increasing order of difficulty. For example, if you start off experimenting with the Serial Dilution Tour and master this section, when you select the next option (Phenotype Identification Tour) it builds on the first option. This would be very helpful to a first time user who could gradually work his way through the experiments and by the time he chooses the Full Menu option, he would be familiar with everything the program has to offer. In the Serial Dilution Tour, the program provides the user with a test-tube of unknown bacteria. The user must dilute the test-tube until he is able to count the number of colonies that are present. I liked the fact that the computer keeps track of the power to which you have diluted the bacteria, and the fact that if you select the test-tube history option, the computer will tell you information about that particular test-tube. In Phenotype Identificaton Tour the computer gives you a petri dishc with colonies. The user can then replicate the plate and choose which nutrient or antibiotic he wants present on the new median. In this section, the Media Matrix and the Phenotype Worksheet make it easy to view what experiments you have performed. The matrix indicates what nutrient or antibiotic is available on which petri dish and the worksheet allows the user to input his own data (he indicates wether or not he has found each nutrient necessary or not and wether the bacteria is sensitive to each antibiotic.) To me, these two options make it very easy to keep track of experiments and conclusions. In the Complementation Tour the same options are available as before, but now the user is also provided with complementation worksheet for which the user indicates which nutrient he is working with. Also, there are several options that let the user decide if he wants to inoculate a tube with a colony on the same median, or different median or plate a tube on the same median or different median. In the Conjugation Tour, all other options are available, but now the user can conjugate two colonies. In general, I found the experiment realistic, because it took several experiments before any conclusions could be made- just like in a real lab. Also, the computer leaves it up to the user to make conclusions- just like in a real lab. In my opinion, this software would be simple for someone who had a knowledge of a MacIntosh and would also help educate the user on the subject matter. (REVIEW 2:RATING=8)>

Lo Cascio,NJT (1990): Forecasting Gene Frequency. (Wisc-Ware) [BIOLOGY, GENETICS,DOS]

<This is a very simple program in my opinion that could be written by a freshman or sophomore student. It has a main menu that gets to three other routines one to make a Chi-Square statistical test and second for genetic projections in Sickle-Cell Anemia third is genetic projections in hemophilia. If you don't want the output to go to the printer you must turn the printer off because the output automatically goes to the printer and you have no choice. There is no help menu or command and a lot of other missing options. Overall not a good software. (REVIEW 1: RATING = 2)

This software is really simple. To me, it merely offers explanations about chi-square, sickle cell anemia and hemophilia. Most of the program consist of written paragraphs about these subjects. One problem I had with it was the fact that it automatically prints everything when ever you press and option. This is really unnerving. There are very few options concerning saving data or manipulating data or error messages. For example, if you incorrectly enter a value you get an error message that is dealing with the program, and you don't receive a message to reenter a value or that the value is not within a correct range. The program is too simple to be of much use, but it could be used by practically anyone. In my opinion, the program would have very little to offer a user except for information about sickle cell anemia or hemophilia. (REVIEW 2: RATING = 2) For review refer to THE QUARTERLY REVIEW OF BIOLOGY June 1991 volume 66 page 242>

McDonnell,Eon (1989(?)): mDNA (mitochondrial DNA mutation

simulator). (ASP Package)
[BIOLOGY, GENETICS,MAC]

<This program provides a student with a tool for exploring different mitochondrial DNA models. The student gives the initial values he wants such as population size, number of generations, length of an individual (up to 400 sites) and the restriction enzyme used. In the simulations, family trees are continuously updated to show current inheritance structure. The student is able to pause the simulation at any time to show DNA, highlight similar groups,or inspect mutations. One can save pictures or data on a file for later use, but this file cannot be printed out using macPaint or similar software (ie picture). Over all, this is a good program and has a good help facility to help get you going. (REVIEW 1: RATING = 6)>

BIOLOGY

Annenberg / CPB project (1990): Isolated Heart Lab (BIOQUEST Software). (Addison Wesley Publisher)
[BIOLOGY,MAC]

<This program is designed to allows the user to conduct his own experiment in order to answer the question, "Does cardiac output change with heart rate? inotropic state? peripheral resistance? or preload?" Within the lab itself the user is able to choose which of these four things he wants to experiment with. The choices include: diastolic function, systolic function, afterload effects, effects on heart rate, or tutorial problem. When a choice is made the user can edit the input in any manner he wants in order to see how this will affect cardiac output. The program is user friendly in the fact that it highlights the input that the user is able to change. Once the information has been edited you can begin the experiment. The user can select start and then the program will graph information as the data changes over time. The user can stop the program or it will stop automatically after a given time. The program gives the user the option of what he wants plotted. The choices include: left vertricle pressure and volume versus time, left vertricle pressure versus volume, or left ventricle pressure and arteriole pressure versus time. The program also allows the user to perform several trials. The program in general is user friendly, because commands are easily understood and performed using the mouse. However, I was not able to figure out how to print out information, if that option is even available. Besides the lab itself, the program has an Isolated Heart Lab Introduction. I thought this was very nice. This part of the program includes: an introduction (which gives definitions and the purpose of the software), the heart plumber's kit (which allows the user to perform a bypass in which the user selects wether he wants to use a valve, ventricle or vessel in each of four spots), pressure time animation (which shows an EKG at the same time it shows the heart pumping with a descripton of each movement and the user can hold the mouse down to see continuous pumping or go frame by frame to understand each section), and a pressure volume loop animation (which does the same thing as pressure time animation, but also includes a volume graph). This part of the program was the most impressive, because the frame by frame descriptons of the heart pumping allows the user to visualize what exactly is happening while reading about it. In my opinion, this software would really be useful to someone who is studying this subject matter. I was able to learn a lot of things just by running the animations, and I feel that someone who is studying this material could learn even more. Overall, it is a friendly software especially if you understand the subject matter. (REVIEW 2: RATING =9)>

Calley,John; Collins,Angelo; Jungck,John (1990): Genetics Construction Kit; A project BioQUEST simulation. (Annenberg Foundation/Corporation for Public Broadcasting Foundation for Microbiology)

[BIOLOGY, GENETICS,MAC]

Calley,John; Jungck,John (1990): Microbial Genetics Construction Kit (BIOQUEST Software). (Annenberg Foundation/ Corporation for Public Broadcasting)
[BIOLOGY, GENETICS,MAC]

Crabbe,James C; Appleyard,John R (1989): Desktop Molecular Modeller. (Oxford Electronic Publishing, Oxford and New York)
[BIOLOGY,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY June 1990 volume 65 page 268>

Dobson,Alan (1988): Acid-Base Simulation. (Bitnet: wiscware@wiscmacc)
[BIOLOGY, CHEMISTRY,DOS]
<This program is the best I have ever seen in the sense of simplicity. There are two commands that I have not seen in any other program - the first one is called control guided tour and the second is called the menu guided tour. The first shows automatically how to perform a simulation using the hints hints he has in the program, and the other one shows a person who is unfamiliar in using windows or a mouse how to do so. For example, it demonstrates how to change the size of the window or how to close a window, etc. Because of these two commands, I think there is no need for a teacher to show you how to use this program. I did know how to perform a simulation, but when I used the control guided tour it showed me exactly how to do so. I strongly recommend this program for in class use by students of any classification. However, like the author said the student should be familiar with the respiratory and the renal function. Note: In my opinion every program should have at least the control tour guide. So if somebody has difficulty using the program, he would not waste so much time getting familiar with the program if such commands existed. (REVIEW 1: RATING = 9) This program was really easy to use. The fact that it is used under windows with a mouse makes all the commands easily accessible. I thought the experiment was neat and it did a good job of demonstrating equations and graphs. I really like the control guided tour. These options allowed me as a naive user to view different controls and there functions. This feature really helps the user be aware of and take advantage of every option the software has. I think that the format of the software could be applied to other programs in order to make them easier to use. In my opinion, this program could be used successfully by all students. (REVIEW 2: RATING = 8)>

Etter,Ron; Maddison,David (1992): Population Dynamics.
[BIOLOGY, ECOLOGY, MULTIPLE POPULATIONS, POPULATION, SINGLE POPULATION,MAC]

Ewin, James C; Ewin,James M (1988): Evolve. (Ewin & Ewin Handel NJ)
[BIOLOGY,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY volume 66 no. 2 pages 241-242>

Foelsch, Paul (1988): Dynamics of the Human System. (Educational Images, Elmira NY)
[BIOLOGY,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY March 1989 volume 64 page 118>

Heckenlively,Donald B (1990): Simzym. (Chariot Software Group)
[BIOLOGY,MAC]

<This software is designed to explore the study of enzymes, as a supplement to introductory class in cell biology or biochemistry. It is easy to use, the program provides a series of tubes in which an enzyme, a buffer and (optionally) an inhibitor may be combined and then incubated at a given temperature for a set time interval. A spectrophotometer is then used to measure the product formation in each tube, and the results are expressed in units product formed per minute. Analytical and graphics tools are provided for determining the Michaelis constant (km) of the reaction. If you are dissatisfied with the results of any of the tubes you may use the Redo Tube command. Also, it is possible to print out graphs and tables from the experiment. For graphs you have the choice of the independent variable and you may choose the tubes that you want to graph. (REVIEW 1: RATING =)>

Horn,Henry S (1989): RealTree. (Wisc-Ware)
[BIOLOGY,MAC,DOS-WINDOWS]

<This program runs under windows. It has very nice tree graphs and is simple to understand in fact it took me no more than ten minutes to be able to design my own tree. As the author said, "Ofcourse the growth of real trees is much more complicated than this program, but this program is capable of drawing a huge variety of tree-like shapes with variation in a few parameters that can be measured on a simple twig of a real tree." In the program, there is 13 examples that helps one see and understand what the program is capable of doing. The only disadvantage I found is that there is no way you can save your data for a tree that you build or to get a print out. So this program can be used in classrooms for students as exercise and demos for building trees. I did not like the Mac version of RealTree as much as the IBM one. The IBM menu and windows are nicer and easier to understand other than that everything else is the same. (REVIEW 1: RATING = 9)

This software was really simple to use and easy to understand. I really liked the graphics and the way that the trees were displayed. The fact that it was used under windows with the mouse made it easy to perform task. I really enjoyed viewing the trees that were there as demos, and I liked the fact that I could change various aspects of the parameters to see what affect each variable has on the shape and height of the tree. I also like designing my own tree. The only problem I could see with the program is that it does not allow the user to save his creation. I feel that this software could be used by anyone and that it would teach a student a lot about trees, even if he had no previous knowledge. In my opinion, the software would be enjoy by students and would also teach them about trees. (REVIEW 2: RATING = 8)>

Jeanne,Robert (1988): Ants. (Wisc-Ware)
[BIOLOGY,DOS-WINDOWS]

<Ants is an interactive program to study the system reliability of different ant foraging strategies. In this program you are asked to select a particular strategy and input the necessary information for that strategy. A schematic for the strategy is either drawn automatically or you are given the opportunity to design one yourself. After the schematic has been drawn the graph o fthe strategy may be displayed. This plots individual reliability versus system reliability. A max of five plots may appear on the graph, after that the oldest one will be replaced by the new one. The program is easy to use but for better understanding of the program you should be familiar with ant foraging and reliability theory. The author suggests the reading of the following paper: Joan Herber, "Reliability Theory and Foraging by Ants", J.Theor. Bio., 1981, 89:175-189. The program requires windows to run. You cannot save a certain schematic for a strategy you have chosen, also you cannot print out a graph or a schematic figure for the strategy you have chosen or clear a graph from a window. (REVIEW 1: RATING = 4) This is very specific software that was designed specifically to study the forging strategies of ants. The software is very user friendly in the fact that it is used under windows, and the

commands are really easy to understand. I had no problem using the program and I think that even people with very limited computer knowledge could use it. However, the program does require previous knowledge of the subject matter. This limits the use of the program, because it cannot be used as a teaching device. The program can only be used to demonstrate specific examples and supplement what has already been learned. The program also has no way to clear graphs, therefore the user must continually look at five graphs and try to figure out which is the most recent. This could present a problem especially if the graphs vary by only a small amount. Also, there is no way to save situations you create or print graphs. I thought the program would have been a lot more useful if there were examples already loaded onto the system that you could experiment with. The thing I liked the best about the program is the you can design your own schematic- this was easy to do and made the program interesting. In my opinion, this software would be a lot more useful if explained the subject matter as well as gave examples. (REVIEW 2: RATING = 4)>

Kohn,Luci Ann; Bennett,Kenneth; Maples,William (1988): Forensic Identification. (Wisc-Ware, Madison, Wisconsin)
[BIOLOGY,DOS]
<For review refer to THE QUARTERLY REVIEW OF BIOLOGY June 1991 volume 66 page 242>

Levitan,Herbert (1988): LOGISTIC. (University of Maryland)
[BIOLOGY, ECOLOGY, SINGLE POPULATION,DOS]

Lo Cascio,NJT (1990): Forecasting Gene Frequency. (Wisc-Ware)
[BIOLOGY, GENETICS,DOS]

Lopez,Gary; Rowlett,Brian (1989): Survival of the Fittest. (Education Materials & Equipment, Danbury, Conn.)
[BIOLOGY, ECOLOGY, PREDATOR PREY,MAC]

Macey,Robert I; Calley,John N; Curylo,T Alex (1990): Axon (a project of bioquest). (Annenberg Foundation/ Corporation for Public Broadcasting)
[BIOLOGY,MAC]
<This program provides the user with a nerve and allows him to perform experiments by adjusting the environment (which includes changing ion concentrations or presence of poisons) of the axon or by changing the stimuli or clamps applied to the axon. The program begins with a main menu which has several options. The program is equipped with several problems that the user can try. These include: qualitative problem, quantitative problem, only k channels, clamp problem, clamp and stimuli or only graph. If the user selects one of these problems he can edit it by selecting new values for variables or he can simply edit the display by stipulating what exactly he wants displayed while the simulation is taking place. For example, if the user simply wants to see the graph he can indicate that or he can indicate if he wants to see a table of values. I like this aspect of the program, because it allows the user to decide what exactly he wants to have displayed on the screen. After editing is complete, the user can choose to "start the problem". Once this is done, the user may perform several trials in order to observe the data. The screen provides the user with a graphical view of nerve properties, and the user can then examine this graph in a couple of different ways. First of all the program allows the user to place a grid over the graph which is helpful in observing the exact value of certain points, secondly there is a line that moves along the graph which is controled by the mouse. In this option, if you click on any point, the data in the data table will change to indicate the values at that particular point, also if you hold the mouse down and continually move it across

the graph you can see what happens in an animated way (in particular, this shows the changes in the ion concentrations over time). There are several other options available in the program, for example you can create your own problem very simply by selecting new problem, and this problem is easily acessible because it is listed with the other problems already included in the program. In general, the software is user friendly, because the commands are self-explanatory and a person with knowledge of a Macintosh and the subject matter could use the program easily. I only had one problem with the program and that is I could not figure out how to perform a trial and then edit my problem without losing the data for previous trials. In my opinion, this software would be useful to people studying axons, because it would allow them to observe things that could not be seen by performing the experiment on an animal's axon. (Reviewer 2: Rating = 9)>

McDonnell,Eon (1989(?)): mDNA (mitochondrial DNA mutation simulator). (ASP Package)
[BIOLOGY, GENETICS,MAC]

Wilkinson,HT; Pederson,WL; Pondy,K (1989): Plant Root Model. (University of Illinois)
[BIOLOGY, ECOLOGY, PHYSIOLOGY,DOS]

Williams G. R. (1990): HyperCELL. (Garland Publishing, New York)
[BIOLOGY, CELL,MAC]
<For review see the Quarterly Reivew Of biology march 1992 volume 67 page 97.>

Myers,Gene; Blanco,Carlos; Jahnke,Jerome; Hallick,Richard (1990): Mac Molecule. (University of Arizona)
[CHEMISTRY,MAC]
<This program takes organic molecules and provides the user with a 3-D model of the structure. The program has a complete list of molecules that are very common in chemistry, all the user must do is select the molecule and the program provides a three dimensional representation of the molecule. Once you are viewing the model, there are other options that can be selected. The program will allow you to rotate the model in any direction you want by simply taking the mouse and clicking it in the desired direction, or the computer will continuously rotate the molecule in any direction you choose until you indicate to stop, or you can indicate in which direction you want light rotated. This program is really user friendly in the fact that all the user must do is click the mouse on the model he wants to use and then select the options he wants to perform (all of which are easily understood). There were only two problems I had with the program and that is the fact that is the model represents different elements within the compound with different colors without indicating what color goes with what element. Also, I think the program should include an empirical formula for the compounds being graphed. Besides that the program does a great job of demonstrating compound in three dimensions. I feel this program would be of great use to students who are trying invision compounds in their minds. The software is certainly a lot easier to use than the model building kits currently being used in chemistry classes. In my opinion, this program would be of great use to someone studying chemistry or learning about organic molecules in biology (e.g. DNA). (REVIEW 2: Rating= 8)>

STATISTICS

Lapin,Lawrence (1987): Easystat. (Harcourt Brace Jovanovich

Inc.)

[STATISTICS,DOS]

<This is an easy software to understand and to get familiar with. The main menu looks like this: Main Menu

File Edit Column Stat Utility Help Quit Each of the above options requires no background to understand except the stat option. Its menu looks like the following:

Stat Menu Summary Hist Probability Regression ANOVA Chi Std.Err Time Non-para In order to use this menu you need to understand the above basic statistical terms. This program has a lot of nice options such as being able to fill a table randomly giving the upper and lower limits. You are able to edit a table, print out a table, graph a column versus another, copy one column to another, or delete a column. You also have a help screen. You are able to perform arithmetic operations on any column (add, multiply, divide, power, logarithm, etc.) In general, this is a nice and easy that need only elementary background in statistics. However, the graphics are not very sophisticated, and they can sometimes be confusing because they graph only coordinates and do not connect them. Also, it doesn't give error messages when you enter the wrong input instead it freezes for some time and then comes back. (REVIEW 1: RATING = 7.5)

This program is similar to a spread sheet with many statical applications. For this reason, I think that most people would find it easy to use, especially if they have worked with spread sheets before. The menus are nice in the fact that when you highlight a menu it prints underneath what options are included in that menu. This makes it easy to access whatever operation you want to perform. I liked the various options the program had concerning the manipulation of data. For example, I liked the fact that you can randomly fill a column with data you have already entered. I liked the fact that the program graphs information for you, especially one column against another, but the graphs are not very sophisticated. I thought the statistical options were very nice. I feel this software would be useful to students who wanted to apply statistics to real situations. I think that it could be used with a class in order to help students apply the distributions they usually only read about. It would also let them compare various distributions. In my opinion, this software is simple to use and could very easily be used by students taking statistics. The only problem I had with the program is that there are no error messages, and on some occasions I found myself having accidentally escaped the program before I realized what was going on. (REVIEW 2: RATING =8)>

Statgraphics (1991): Execustat. (PWS-KENT Publishing Company, Boston)

[STATISTICS,DOS]

<This is the most wonderful statistical software, I have played with so far. You can almost do everything without using the manual. It has wonderful three dimensional and two dimensional graphics. It has all the options you can imagine on the axis such as rotating, resizing, etc. It is easy to make your own file, save files, print files, load files, etc. Every time you enter a command, it provides the user with options for input. This option makes it where the user cannot enter incorrect data. It is a good software that could be used by students or professionals. Basically, I did not find anything wrong with this software, and I would recommend it for anybody. (REVIEW 1: RATING = 9)

I really enjoyed using this software. Its capabilities seemed unlimited. The program is very user friendly, and I was able to enter my own data, make three dimensional plots, rotate the plots, and analyze the data without having to use the help command or consult the user manual. The commands are always listed in front of the user, and the user must merely select what he wants to do and press enter. I was really impressed by the fact that when the computer as you to input data, it gives you choices. For example, it will prompt you to enter a variable and underneath it list the possible variable names that you might select. I also liked the fact that when you retrieve files it list the files available to be retrieved. This saves the

user from having to remember what he named files or from having to exit the program and look in the directory for data files. The graphing capabilities were great. The program has all kinds of graphs from simple histograms to three dimensional plots where the user can rotate the axis. Another thing I liked about the program is that when you select different ways to analyze data there is always an interpret option. This option explains exactly what the data is telling you and what everything means. I think that students taking statistics or probability would really find this software useful. The program would certainly help students viualize and analyze data while at the same time being user friendly. (REVIEW 2: RATING = 9)>

Triola,Mario F; Flynn,William J (1986): Statdisk. (Benjamin/Cummings Publishing Company)
[STATISTICS,DOS]

<In the main menu it has the following options: descriptive statistics, binomial probabilities, sample generator, hypothesis testing, sample size determination, confidence intervals, correlation and regression, multinomial experiments, contingency table, analysis of variance, sign test, kruskal-walles test, runs test. Note that it has options that Easystat does not have. For example, it has multinomial experiment and confidence intervals. However, it does not have all of the options of Easystat like chi-square test. This has a better data generator than Easystat does and it gives the options to choose the intervals in which you want your data to lie in or the mean that you want your data to have. The program draws histograms for your sample data and gives the option on how many intervals you want to include on the histogram. You can print out your data using the print screen key in any menu, data sample or histogram. In general, this is a good statistical program, but in my opinion Easystat is easier to use. (REVIEW 1: RATING =7.5) In general, this program was user friendly and could easily be used by a student. I think that it would be useful to students if they were trying to work examples for class using the different test the program offers. The program would allow them to input the data and see the results without having to make the calculations. I do not think that the program is very useful for analyzing large amounts of data that you put in yourself. The program will generate a mean and standard deviations, but it doesn't seem to allow the user to apply different statistical test to data they enter. In my opinion, this software is easy to use, but limited in its capabilities. (REVIEW 2: RATING=7)>

Statistics Packages for PC.
[STATISTICS,DOS]

<For review of several statistics packages for the PC such as Systat, Stata, Crunch etc. see the ecological society of America March 1992 volume 73 No. 1 page 74>

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