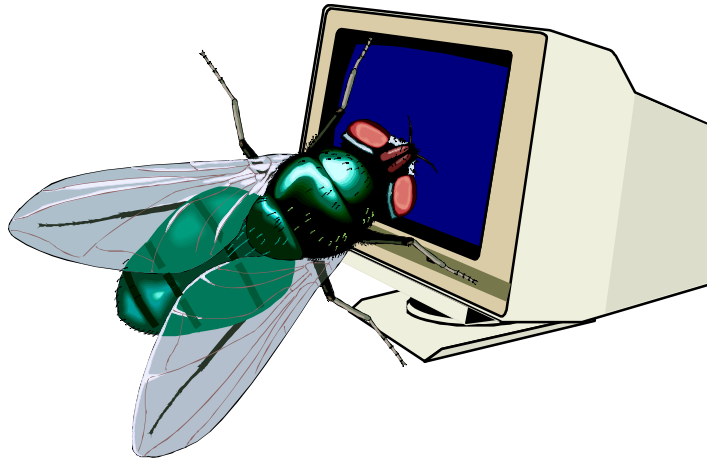


PC-FLY



Software to facilitate virtual crosses between flies

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I. What can you do with PC-Fly? What can't you do?

By this time you have learned a lot about your three strains of flies. You have learned which traits are dominant and which are recessive. You have learned which traits are sex-linked. You have learned whether any two traits are linked to one another. But you have not learned where on the *Drosophila* genome the genes determining the traits lie.

Without this information, you cannot communicate to anyone else about your mutants.

"I have a mutant fly with a dark body", you say to a colleague in Australia.

"Why, so do I!" he responds.

"Mine also has two head. I think I've discovered a fundamental connection between body color and morphological development."

"'Fraid not, lad. Mine has a dark body but just one head."

"You must have a different sort of black fly"

"Maybe not. I bet it's just the swill you're feeding it."

See? This is important. How can you tell if the mutants you're considering are the same? They may look identical, so don't bother sending a photograph, but the same phenotype might be conferred by very different genes. But what a difference if you can say,

"Food, eh? Well my fly's black body phenotype maps to position 24.7 of chromosome 3."

"Well, you got me there. Mine maps to position 47.9 of chromosome 2. Guess it's on to Stockholm for you."

So you see, you have to learn how to map your mutations.

PC-Fly is designed to simulate crosses between your unknown flies (which are built into the program) and flies carrying mutations at known positions in the chromosome. By mapping the unknown mutations relative to known markers, you can identify the chromosomal their locations. You can also cross flies with known markers with each other, but that doesn't get you very far.

What you can't do is cross one of your unknown flies with another unknown fly. That's what you're supposed to do with living, crawling flies, and the program has been instructed to do nothing that may diminish your laboratory pleasure.

II. How to run PC-Fly

You should have received in your e-mailbox a file called *Pcfly.exe*. Here are two methods to run the program:

- a. Run from Eudora (or similar mail program): Click on the link *Pcfly.exe*. Do this only if you're at a PC. The program will not work on Macs. If the opening screen is small, click on the square button at the upper right hand corner of the window to maximize the screen.

- b. Run from floppy disk: If you save your mail on a floppy disk, insert the disk into the computer, click on the **Start** button (lower right hand corner), then **Run**, then **Browse**. Click on **down**-arrow of **Look in**: window. Click on **A:** drive. Click on *Pcfly.exe*.

If you get to a screen entitled "*Introduction to PC-Fly*", you win. There are many other ways, better ways, to run Pcfly conveniently. If you have any trouble, please contact me.

III. General Instructions for use of PC-Fly

III.A. Navigation

First of all, PC-Fly doesn't know anything about mice, sorry, so get your hands on the keyboard. Here's how:

- Navigate from one choice to another.....Use the vertical/horizontal arrow keys
- Accept the highlighted choice Press the **Enter** key
- Accept all choices on a page Press the **End** key
- Get out of a place you'd rather not bePress the **Esc** key

III. B. Commands

- 1. Set up a cross:** You will spend most of your time doing setting up the crosses, which, once set up, will be performed almost instantaneously. You have the following choices:
 - a. Unknown fly: Refer to your unknown flies by the strain number you were given. If you're not sure of the strain number, guess. PC-Fly will tell you what it thinks the strain looks like. You can manipulate only one unknown strain at a time, so it is impossible to cross one unknown with another.
 - b. Stock strain: Choose amongst several phenotypes to compose your own fly. Flies you make in this way will be pure breeding.
 - c. Mixed progeny: Use a mixed population of males or females resulting from a previous cross, regardless of phenotype.
 - d. Individual progeny: Select a progeny of a specific phenotype from a previous cross.

Previous crosses are referred to by sequential number. If you forget the number of a cross you're interested in, use the **Show Cross** command (described below).

- 2. Do Cross:** Select this command after you have set up the cross and the cross will do itself. You'll be reminded of the phenotypes of the parents and then you'll be shown the number of the progeny (male + female) and the number of progeny exhibiting each phenotype.
- 3. Show map:** Many times you will be searching for a gene that maps at a certain location, so that you can test its proximity to your unknown gene. This command

calls up a map of the four chromosomes of *Drosophila* so that you can choose appropriate markers. Use the arrow keys to select the chromosome you're interested in and then press **Enter**. You will see all the markers on the selected chromosome that PC-Fly is familiar with. Note the two-letter abbreviation, because all lists of phenotypes will use this rather than the full description. The numbers next to the phenotypes are the positions on the selected chromosome in centiMorgans (or map units).

- 4. Show cross:** Often you will need to dip into a prior cross, perhaps to pick out a population of F₁ progeny. PC-Fly refers to crosses by number, and if you forget the number of a critical cross, you can remind yourself through this command.
- 5. Start over:** Sounds dismal, but you will need to start over every time you switch your attention from one unknown strain to another. PC-Fly can consider only one unknown strain at a time.
- 6. Quit.** Inevitably the time comes when good things must end. You will probably find that ending the program leaves the last screen visible. To get rid of it, click on the X button in the upper right corner.

IV. Strategies

IV.A. How to get a population of F₁ progeny

- 1. Set the parental cross:** Choose your unknown strain as one of the parents (say male) and choose a stock strain as the other parent. The stock strain should have at least one marker on a chromosome you think the unknown gene may reside on. Press the **Esc** key to get back to the main menu.
- 2. Do the cross:** You now have F₁ progeny. The only trick is to remember the number of the cross that produced them. Paper and pencil help.

IV.B. How to get a double recessive strain for a test cross

- 1. Set the F₁ cross:** Choose *Mixed progeny of cross* and select the number of the cross that produced the F₁ progeny. Do this for both male and female.
- 2. Do the cross:** You now have F₂ progeny. If the double recessive strain appears, you've got what you wanted, otherwise go on.
- 3. Set an F₂ cross:** Choose *Mixed progeny of cross* and select the number of the cross that produced the F₂ progeny. Do this for both male and female.
- 4. Do the cross:** You now have F₃ progeny.
- 5. Repeat these steps until a double recessive appears:** The closer the selected marker is to the unknown gene, the more crosses it will take (if both are recessive). This is because you require two rare recombinant chromosomes to come together in a progeny.

IV.C. How to analyze data by Chi²

With a pencil and paper. Or a calculator.