Since the adenylate cyclase-linked DA receptors in substantia nigra are more concentrated in the dendritic (zona reticulata) than in the cell body area (zona compacta) of DA neurones[3,8], various series of VTA punches were investigated which included, to differing degrees, tissue around the area of highly concentrated DA cell bodies. Thereby, we attempted to include tissue possibly rich in DA dendrites and DA receptors but relatively deficient in DA cell bodies. Similar results were obtained with the various samples (single values not shown). A study of the distribution and morphology of the A10 dendrites, as well as of mesolimbic feedback axon terminals (other than those originating from the nucleus accumbens) would be desirable to substantiate the present conclusions.

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The sparing effect of dose-fractionation in adult *Drosophila*

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Summary. The sparing effect of dose-fractionation was observed in adult male and female *Drosophila melanogaster;* 24-, 48-, 72-, and 96-h-old female flies, in general, show a higher recovery (increase in life-span) following dose-fractionation as compared to the males of the respective age. Recovery in 72-h-old females is maximal (31% increase in life-span) as against only 12% increase in the life span of the males.

Sparing effect of dose-fractionation is well documented in single cell systems like algae[2], yeast[3] and various types of cultured mammalian cells[4] as well as multicellular entities such as fish[5], larvae and imaginal stages of insects[6–9]. The presence of repair mechanism(s) in irradiated adult *Drosophila* has been deduced from experiments with fractionated doses[10]. In these experiments, a 'sparing effect' has been observed. Since adult male and female *Drosophila* show differential radiosensitivity towards gamma-rays[11–13], the present experiments were designed to study the kinetics of recovery in 24-, 48-, 72- and 96-h-old males and females separately.

Adult flies were exposed to gamma radiation in a 5500_{Ci} 60_{Co} gamma cell. The gamma radiation dose was 60 krad given either as a single dose, or as 2 equal fractions of 30 krad each separated by intervals of 6, 12, 18 and 24 h. Prior to irradiation, randomly selected samples of about 100 males and 100 females of the required age were sedated with ether and transferred to vials for irradiation. After the initial irradiation, the flies were immediately returned to the food vials. For a 2nd irradiation, the flies were transferred to small vials without using ether. Deaths were scored daily. The percentage mortality (initial number of adults/number of flies dead) (N/No.) was used to score the effect of treatment. Surviving flies were transferred to fresh food vials every eighth day.

The table shows the magnitude of recovery among females which is quite remarkable (31% increase in life span) as

Data showing percentage recovery (increase in life-span) adult *Drosophila melanogaster*

Time interval (between 2 fractionated doses)	Age of fly (h) Male				Female			
	24	48	72	96	24	48	72	96
6 h	Nil	Nil	4.1	Nil	17.2	20.0	29.6	23.0
12 h	9.5	4.6	Nil	Nil	12.4	20.0	26.4	20.5
18 h	Nil	Nil	4.1	Nil	28.1	25.0	31.2	30.7
24 h	1.1	Nil	12.3	Nil	18.9	30.0	20.0	29.0

The percentage recovery was calculated by comparing mortality following split dose (30 krad and 30 krad) with a dose-response curve produced by single exposure (60 krad) of adults of same age and treatment. Number of flies taken in each treatment = 300.

compared to the males where maximum 'sparing effect' in terms of increase in life span is only around 12%. It has been demonstrated that the colony-forming ability of cultured mammalian cells exposed to radiation given in 2 equal fractions was maximal if the interval between the 2 fractions was 2-3 h, declined slightly with somewhat longer intervals, and in some cases it rose again when the intervals were much longer. This phenomenon, often referred to as 'Elkind kinetics'[14], demonstrates that there is one very rapid and another much slower phase of repair of radiation injury, and that repair is at the subcellular level, since in cell cultures there was no opportunity for cell replacement.

Studies with varying interfraction intervals reveal that maximum sparing effect in females of dose-fractionation is obtained with an interval of 18 h (table). The LD50 values are about 12.5 and 16.2 days for 60 krad delivered in single and split-dose respectively. Kinetics of recovery through dose-fractionation was analyzed in *Tribolium confusum* where maximum recovery was obtained with 5 h interval[15]. Adult male *Drosophila* is considered to be a predominantly postmitotic system compared to females which have dividing cells associated with ovarian development. In the current experiments, maximum recovery has been observed in the females, which implies that the dividing cells associated with ovarian development are able to repair efficiently.

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Behavioral convergence in the defensive displays of snakes[1]

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Summary. Comparison of habitats and defensive displays in 129 species suggests convergent behavioral evolution. In snakes, antipredator tactics are apparently superimposed at the population, species, or generic level on much older adaptations for feeding.

What kinds of motor patterns are stable over long periods of evolutionary time? What kinds change rapidly, and why? How are the rates and directions of change constrained by other factors? These important evolutionary problems[2-4] have rarely been addressed from a rigorous comparative perspective, perhaps because it is difficult to obtain large and diverse enough samples of taxa to be informative. Here I summarize observations and literature on 129 species of snakes (77 genera, 5 families) that exhibit 3 widespread types of defensive displays. The goal is to distinguish between ancient and recent origins of behavioral similarity by searching for phylogenetic or ecological correlations[5,6].

Methods. Genera were used in this analysis, with 1 exception, because all species in most genera used the same display type and because the 16 species of *Micrurus* would bias the comparison. 5 species of *Oligodon* use tail displays; *O. arnensis* uses a head display and was scored separately. *Drymarchon*, *Erythrolamprus*, and *Heterodon* were excluded because they each use 2 display types. The remaining 75 taxa were classified as a) fossorial and/or terrestrial or b) arboreal or semiarboreal. Tail displays are postural shifts in which the tail is made more prominent than it is in a normal resting posture or locomotion. This can consists of elevating and in some cases coiling and waving the tail back and forth. A vertical head display increases the dorsoventral dimension by laterally compressing and/or inflating the anterior part of a snake's body. This often also includes drawing back the anterior part of the body into an exaggerated S-shaped coil, spreading the posterior part of the head, and opening the mouth. A horizontal head display increases the lateral dimension by dorsoventrally flattening the anterior part of the snake's body. This is often accompanied by elevation of the head and anterior part, and sometimes by holding the mouth open. For descriptions of individual taxa see[6-8].

Results and discussion. The table demonstrates that display types are significantly associated with habitat classes. Factors selecting for the repeated evolution of similar displays remain to be studied, but could include characteristics of the snakes, their predators, or their interactions peculiar to each habitat.

Tail displays are almost entirely restricted to terrestrial or fossorial snakes (97.6% of 42 genera with this behavior). These are assigned to the Aniliidae, Boidae, Colubridae, Elapidae, and Viperidae, and the latter 4 families also include arboreal species that do not use tail displays. It is possible that the similar displays of aniliids and boids are shared primitive behavior patterns that were present in ancestral snakes. However, the burrowing colubrid and elapid genera almost certainly resulted from numerous independent derivations from a generalized terrestrial colu-

Relationship of habitat to defensive display behavior in 75 snake taxa (χ^2, $p < 0.01$)

Habitat	Tail display	Vertical head display	Horizontal head display
Fossorial or terrestrial	38	3	20
Arboreal or semiarboreal	1	13	0