Most of you have probably noticed that many tractor-trailers and some heavy-duty trucks are fitted with modular tail light assemblies, like those shown in the photograph to the left. These units are held in place by heavy rubber gaskets which are placed in holes present in a rear metallic cross-member of the truck or semi-trailer.

These assemblies include an opaque white backing and a translucent red lens. A glass bulb with two filaments is included in the sealed assembly. A standardized, three-prong connector is molded into the white backing; a standardized plug connects these assemblies to the electri-cal system of the truck. The rubber gasket both holds these assemblies in place and provides some measure of shock abatement. When either of the filaments in the enclosed bulb ceases to function, the assembly is pried out of the gasket, discarded, and replaced with a new one. At least, that's the intention. Replacements are not always provided as soon as operating condi-tions permit; we've all seen some trucks whose lighting systems were not fully functional.

In order to examine the bulb inside an assembly of this type, it is necessary to remove the sealed plastic housing. The material of the housing is extraordinarily tough. My experience with these has led me to the conclusion that the best method of examination of the enclosed bulb is to hack-saw enough of the housing away from it. I use a hand-driven hacksaw, because a power tool would probably melt the plastic and may even initiate a fire. (Haven't tried it, don't want to!) This material is so tough that cutting into two assemblies will strip all of the teeth from a metal-cutting hacksaw blade. Fortunately, hacksaw blades are cheap. The cutting process typically involves several slices, to enable the bulb to be examined but also to provide photographic access. Observations may not have any usefulness without the photographic documentation of their validity.

The photograph to the left shows the bulb in one such partially dissected assembly. This bulb contained one hot-shocked filament and one cold-broken filament. The physically larger filament is the one which glows brighter and is used for turn signals, brakes, and emergency flashers. The smaller filament glows for parking lights/running lights. Typically, the lower-intensity filament is incandescent during most periods of night-time driving, and some tractor-trailer drivers leave exterior lights on whenever they are driving.

The two photographs above are different views of the same bulb. This is a more conven-tional automotive bulb. The typical two-filament automotive bulb has a circular base, usually of brass, or a rectangular plastic base with protruding electrical contacts. This bulb was removed from the rear of a pickup truck which had been struck in the rear. The abnormal appearance of the smaller filament shows that this truck's tail light was incandescent at impact. The normal condition of the larger filament shows that the brakes were not applied and that no turn signal or flasher had been used within the few seconds preceding impact. There will sometimes be a small amount of curvature in the filaments of a bulb. This curvature is usually an as-manufactured condition.

Filaments in lamps of this type are made of tungsten. Tungsten has some unique properties which make it ideal for lamp filaments and also provide means of determining if a bulb was on or off at impact. At ambient temperatures, tungsten is very brittle and chemically inert. If a cold filament is removed from a lamp and placed on the ground, it will stay clean and shiny for years. If a hot filament is exposed to air, it will oxidize rapidly and burn out almost instantly. Oxides of tungsten take many forms and colors, the most common being a white or yellow powder similar in appearance to talc and a dark, blackish-blue surface on the filament, similar in appearance to a blued gun barrel. In an incandescent state, tungsten is quite ductile; i.e., it deforms easily. When an incandescent filament in an automotive bulb is subjected to a high level of acceleration (typically above 20 times the acceleration of gravity), that incandescent filament will probably deform. After the accident, the deformation is permanent and can be observed, as in the bulb shown above. A filament which is not incandescent will not exhibit