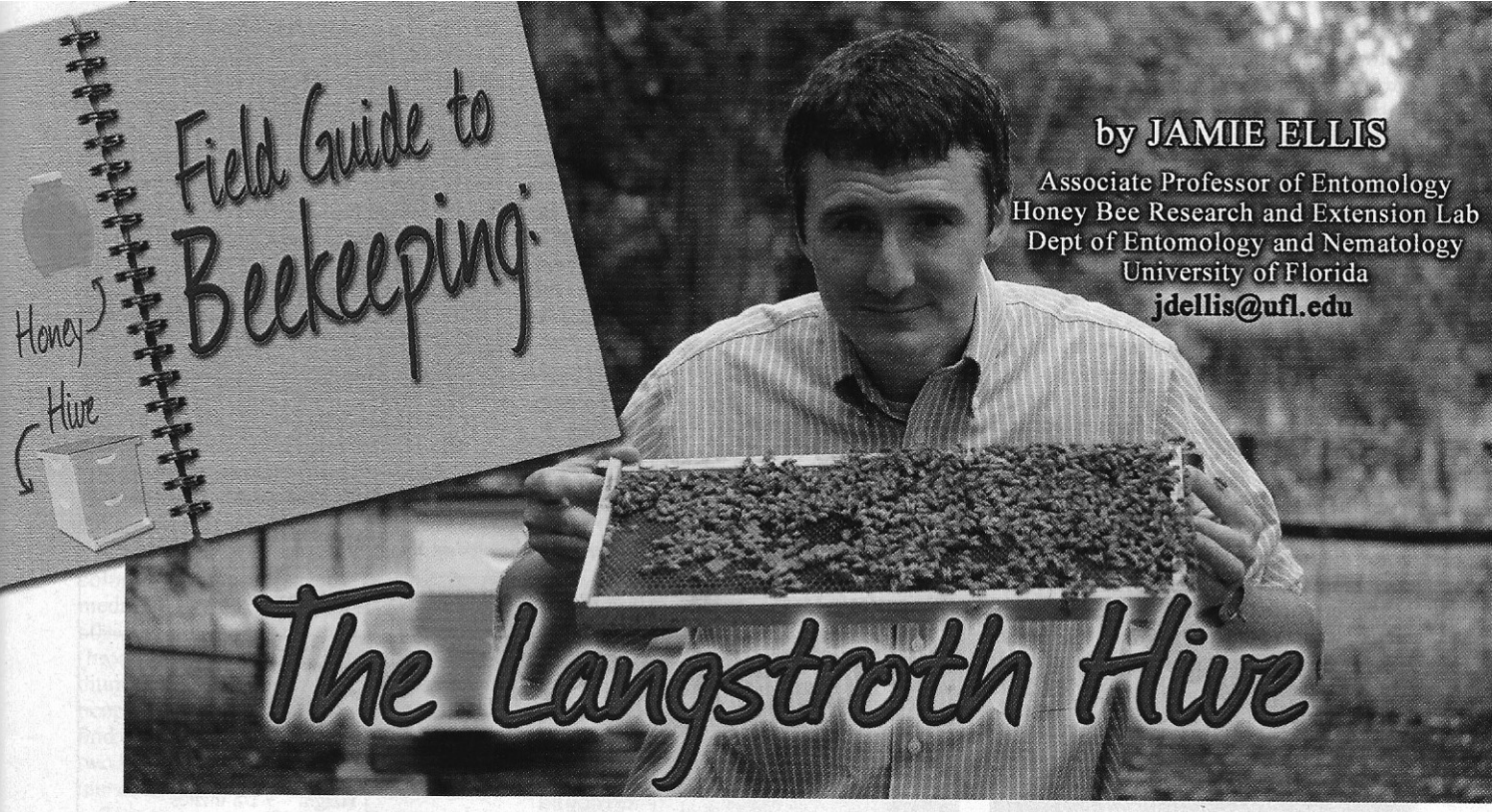

The Langstroth Hive

by JAMIE ELLIS
Associate Professor of Entomology
Honey Bee Research and Extension Lab
Dept of Entomology and Nematology
University of Florida
jdellis@ufl.edu

Introduction

Managed honey bees have lived in a number of different types of hives designed by beekeepers over the last couple of centuries. The early hives were simply cavities of any type into which beekeepers would install a swarm of bees. Though honey bees will readily nest in many types of cavities provided to them, one cannot manage a colony easily if it is allowed to make comb in any direction it wishes. Given the choice, bees will attach comb to the ceiling of their home and layer it vertically in sheets as the hive grows. Beekeepers wanting to work these colonies and harvest the honey they contained had to disturb the bees significantly. Entire combs often were cut out of a target hive, sometimes leading to the colony's demise. Beekeepers and hive architects developed a number of hive styles in response to the problem of destructively harvesting honey from colonies. Any review of bee hive development over the years will yield interesting information (and photographs) about the history of hive design. Ultimately, the bee hive went through many prototypes before arriving at the type of colony most beekeepers use today.

The most commonly-used, "modern" bee hive was designed by Lorenzo Lorraine Langstroth in the mid-to-late 1800's. Langstroth was a minister, but he also indulged in the art of beekeeping. He is considered by many to be the "Father of Modern Beekeeping" or the "Father of American Beekeeping". Langstroth's contribution to hive design rested on a simple observation: worker honey bees do not put wax or propolis in spaces that are 3/8 inch. This distance is now called "bee space". Due to his observation, Langstroth designed a hive that has internal spacing between all of its components of 3/8 inch, thus making it possible to remove the combs from the colony without them being destroyed. Langstroth developed the first truly successful "movable-frame hive".

Figure 1 shows the typical Langstroth hive arrangement used by many beekeepers. It is important to remember throughout my discussion of the Langstroth hive that beekeeping is both a profession and an art. As such, opinions vary considerably about the approach to using the various hive components. I simply describe herein the most common parts of a Langstroth hive. Furthermore, the names for each piece of the hive vary somewhat by the region of the U.S. where the piece is used. I try to include as many common names for each piece of equipment as possible, recognizing that I, undoubtedly, will omit some of the names inadvertently.

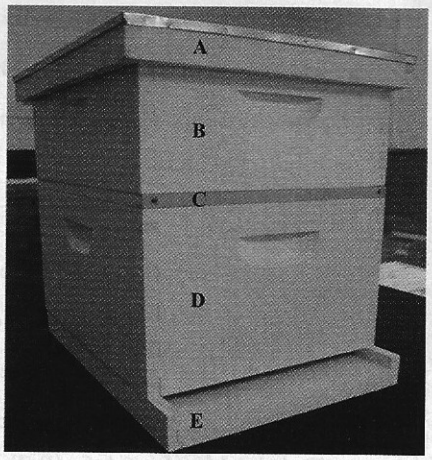

Figure 1: The Langstroth colony: A) telescoping cover. B) medium (or Illinois) super. C) wood-bound queen excluder. D) deep brood chamber. E) screened bottom board. (photo – Jamie Ellis, University of Florida)

The lid

All hives are covered by lids (or covers) that protect the hive from the elements. Beekeepers use two major styles of lids on their hives. They are shown in Figure 2 and are

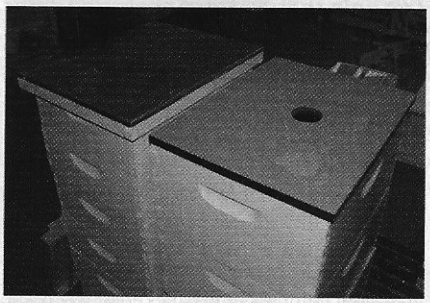

Figure 2: The two types of lids used on honey bee colonies. The lid on the left is a telescoping lid (or cover). Notice how the edges of the lid hang over the uppermost super on which it resides. It is necessary to use an inner cover when using a telescoping lid. The lid on the right is a migratory lid. Its edges are flush with the super on which it rests. This facilitates stacking of colonies on a vehicle for transportation purposes (i.e. the hives fit closer together on the truck). The lid also contains a feeder hole into which a beekeeper can place a jar of sugar water. (photo – Jamie Ellis, University of Florida)

the telescoping cover (outer cover) or migratory cover (migratory lid). Telescoping covers are usually covered by a thin piece of sheet metal that offers added protection against the elements. They are called "telescoping" covers because they protrude past (or "telescope") and hang over the edge of the hive. These lids must be used in conjunction with inner covers (Figure 3) because of bees' copious use of propolis (a sticky mixture of various plant saps and resins). Bees will glue the lid to the frames underneath it using propolis. Because telescoping covers hang over the edges of the uppermost super, one cannot easily pry such a cover from the frames if it is glued to them, hence the need for an inner cover. Inner covers fit flush with the uppermost super so they can be pried from the frames below. Most inner covers also contain a hole that accommodates the Porter bee escape, a device used as a one-way valve for limiting bee return to the area left when traversing the escape. The inner cover also can aid in the upward ventilation of a colony if a notch is cut in its rim. Air can leave the colony first through the hole that accommodates the bee escape and then through the notch in the rim.

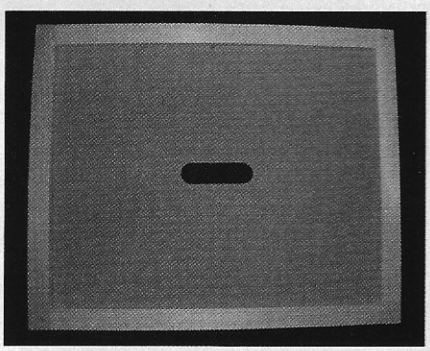

Figure 3: The inner cover with a central hole that accommodates a Porter bee escape. (photo – Jamie Ellis, University of Florida)

The benefits of telescoping covers/inner covers lie with their sturdiness and resistance to the elements. Commercial beekeepers typically do not like to use them because they are bulky and expensive compared to the alternative lid style available. Furthermore, the telescoping nature of the lids does not allow colonies to be stacked close to one another, thus resulting in a loss of space efficiency when loading colonies on a vehicle to move them.

Many beekeepers use migratory lids (Figure 2), so named because they facilitate the migratory nature of some bee hives. The migratory lid lies flush on the uppermost super so colonies can be stacked tightly together on a moving truck. Migratory lids often contain a hole into which an inverted jar can be placed for purposes of feeding bees. The lid of the feed jar (pointing down into the colony) contains small holes from which the bees can drink sugar water or corn syrup.

The "boxes"

Langstroth hives are composed of a series of stackable boxes that can be added or removed as the hive grows or shrinks respectively. The boxes are called a number of different names (see Table 1). However, they are typically referred to as "supers" when used for honey production or "brood box" when they house a laying queen and the resulting brood. They may even be called "hive bodies" since they constitute the external, physical structure of the hives. The name "super" likely comes from the idea that more of the boxes can be added to the top of a colony. Beekeepers use "super" as a noun (the physical box) and a verb (to "super" a colony is to add more boxes to it).

There are three heights of boxes used for the Langstroth hive. They are the deep, medium (or Illinois) and shallow boxes. Most typical hive arrangements (such as that shown in Figure 1) have 1-2 deep boxes used as the brood chamber(s) and 1+ honey supers which are usually shallow or medium supers. That convention is changing today as many people find it easier to work

Table 1: Characteristics of the three types of hive boxes and the frames they accommodate. It is important to note that the dimensions reported here may vary slightly by manufacturer and due to the width of the wood used during construction.

Common name of the three sizes of standard, 10-frame Langstroth boxes[1]	Box dimensions (outside dimensions when using 3/4 inch wood for construction)[2]	Typical outside dimensions of frame accommodated by each box size
deep box, deep super, deep brood chamber, brood chamber, deep hive body	Length – 19 7/8 inches Width – 16 1/4 inches Height – 9 5/8 inches	[3]Length – 17 5/8 inches [4]Width – varies slightly by manufacturer Height – 9 1/8 inches
medium super, medium box, Illinois super, medium brood chamber, medium hive body	Length – 19 7/8 inches Width – 16 1/4 inches Height – 6 5/8 inches	[3]Length – 17 5/8 inches [4]Width – varies slightly by manufacturer Height – 6 1/4 inches
shallow super, shallow box, shallow brood chamber, shallow hive body	Length – 19 7/8 inches Width – 16 1/4 inches Height – 5 3/4 inches	[3]Length – 17 5/8 inches [4]Width – varies slightly by manufacturer Height – 5 3/8 inches

[1]"Super" usually denotes a box that is used for honey production. The same box will be called "brood chamber" if the queen is allowed to lay in the combs contained within it. For example, a deep brood chamber is simply a deep box used as the brood chamber. The same box located above a queen excluder (i.e. the queen has no access to it) and used solely for the purpose of storing honey would be called a deep super.

[2]The inside dimensions of a super made of 3/4 inch wood are: Length – 18 3/8 inches, Width – 14 5/8 inches and the designated height unique to that size box.

[3]This is the length of a frame from the outside of one side bar to the outside of the other. This does not include the "lugs" on both ends of the top bar. The typical length of the top bar of a frame is ~18 15/16 – 19 inches. It is longer because the part projecting from both sides of the top bar of the frame (the lugs) sits on the given box's "frame rest" or ledge in the box from which the frame hangs.

[4]The width of a frame typically oscillates around 1 1/8 inches, depending on manufacturer.

Figure 4: The three sizes of Langstroth boxes: shallow (uppermost box), medium or Illinois (middle box), and deep (lowermost box, photo – Jamie Ellis, University of Florida)

colonies composed strictly of shallow or medium boxes. A full deep box can weigh 60+ lbs, depending on the comb contents (brood, honey, etc.). Full shallow and medium boxes weigh significantly less. Some people, such as children and the elderly, find colonies composed exclusively of these two box types to be more conducive to hive management.

The boxes are made to accommodate "frames" and the industry standard box has room for 10 frames. Many beekeepers are beginning to use 8-frame boxes due to the lighter weight of the resulting colony. One final note: I recommend that beekeepers not use shallow AND medium supers in their operations. Shallow frames can fit in medium supers, leading to management inconveniences further down the road. Beekeepers typically choose one or the other box to use, but not both.

The frames

The beauty of the Langstroth colony lies in the movable frames. The frames are simply rectangular structures that accommodate the combs which the bees construct (Figure 5). Most frames are made of wood, though increasingly they are made of other materials such as plastic. As you might imagine, there are three frame sizes (Table 1 and Figure 6) that are used in the three different hive boxes. The frames are composed of 4 parts: the top bar (Figure 7), two end (or side) bars (Figure 8), and one bottom bar (Figure 9). The top and bottom bars are the same sizes for shallow, medium, and deep frames. The sides, on the other hand, are different for all three frame types, thus varying the height of the frames.

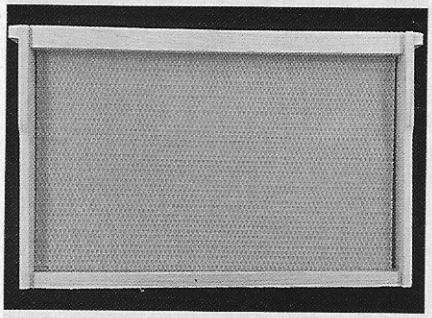

Figure 5: An assembled deep frame containing a sheet of plastic foundation. (photo – Jamie Ellis, University of Florida)

The top bar of the frame (Figure 7) contains a grove into which the foundation can be placed. Foundation is the structure on which the bees will build comb. Historically, foundation (seen in the frame in Figure 5) has been milled out of pure beeswax into thin sheets containing hexagonal imprints. Bees will "draw" or "pull out" the individual cells from this foundation. They do this by secreting wax on glands underneath their abdomen (or "belly"), working the wax with their mandibles (or "mouth"), and placing it on the foundation. Today, a lot of foundation is made of plastic and one can even purchase entire combs constructed of plastic.

Figure 6: The three sizes of frames that are accommodated by the three sizes of hive boxes. From left to right, the frames are shallow, medium, and deep. (photo – Jamie Ellis, University of Florida)

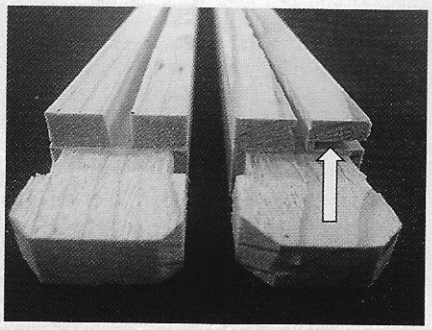

Figure 7: Frame top bars. Top bars (both pictured with their underside facing up) come in two styles: grooved (left) and wedged (right). The wedge or cleat (arrowed) is removed to accommodate the placement of foundation and secured back into place using nails or staples. (photo – Jamie Ellis, University of Florida).

Frame top bars come grooved or with a wedge cleat (Figure 7). The grooved version is most popular today since much of the foundation is designed to snap into the frame. Top bars having "wedge cleats" usually are used for crimp wire foundation (beeswax foundation that contains wires for support). The cleats can be removed, the foundation inserted, and the cleat nailed or stabled into place to secure the foundation.

The sides or end bars of a frame vary in height to match the box (shallow, medium or deep) in which they will be used. The wooden end bars usually contain holes through which wires can be run to stabilize the foundation contained within the frame.

The bottom bar of the frame comes in three styles: (1) solid, (2) grooved, and (3) split (Figure 9). Each is made to accommodate specific types of foundation, with the grooved design being the most popular.

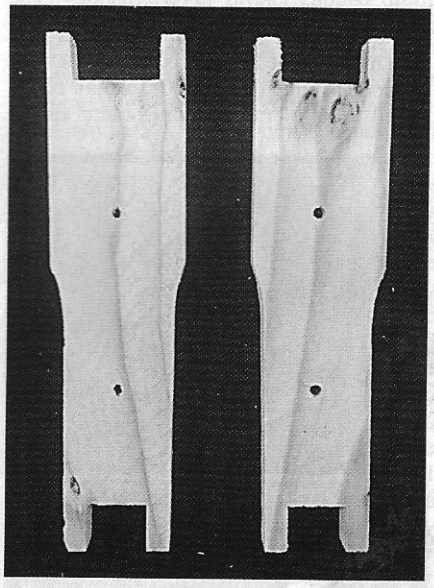

Figure 8: The side or end bars of a shallow frame. Framing wire can be passed through the holes and used to secure the foundation. (photo – Jamie Ellis, University of Florida)

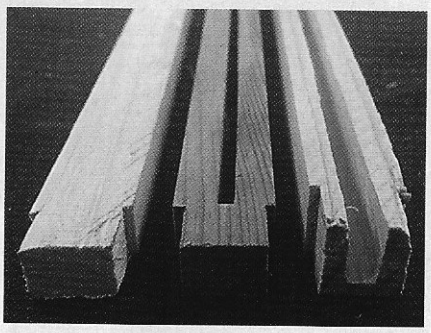

Figure 9: Frame bottom bars. Bottom bars come in three styles: solid (left), split (middle), and grooved (right). The three styles each accommodate different types of foundation. (photo – Jamie Ellis, University of Florida).

Queen excluders

As the name implies, queen excluders (Figure 10) "exclude" queen honey bees from certain areas of the hive. Excluders are grid-like in design and usually made of metal, though plastic is used increasingly. The holes produced by the gridding are large enough for the worker bees to traverse but are too small for the large queen to pass. Consequently, excluders should not slow the work done by worker bees, though many beekeepers prefer not to use them because of fears that excluders hamper normal colony function.

Excluders are usually placed between the brood chamber (usually the lowest box or boxes on a hive) and the honey supers (the uppermost boxes on a hive). In Figure 1, the excluder is above the deep brood box but below the medium honey super. The queen, therefore, is confined to the lowermost box, thus unable to lay eggs in the honey supers above.

Queen excluders are normally referred to by the material from which they are made and bordered. For example, a metal grid with metal frame (Figure 10a) and one with a wooden frame (Figure 10b) would be referred to as a "metal-bound, metal queen excluder" or a "wood-bound, metal queen excluder" respectively. This is usually shortened to "metal-bound" or "wood-bound" excluder. Plastic queen excluders are called just that: "plastic queen excluders".

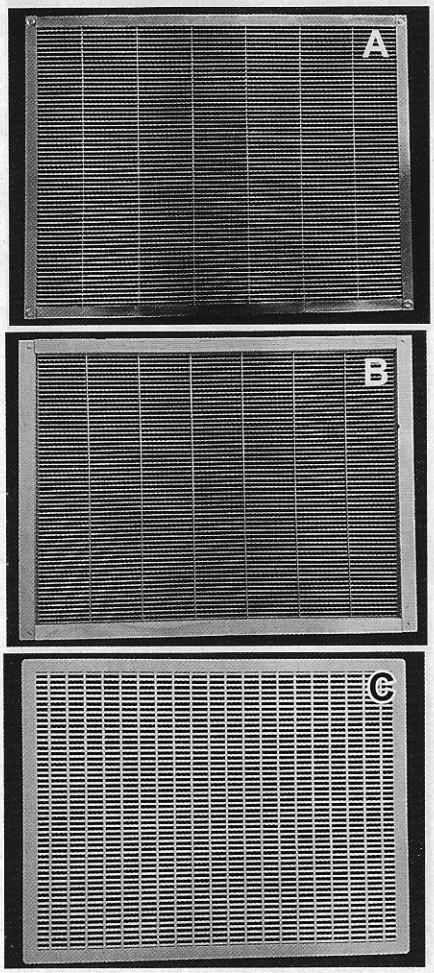

Figure 10: The queen excluder: A) metal-bound excluder, B) wood-bound excluder, and C) plastic excluder (c). (photo – Jamie Ellis, University of Florida)

The hive bottom board

Langstroth hives traditionally have rested on bottom boards composed of pieces of wood that have a raised rim around the upper surface on which the brood chamber can sit (Figure 11). The raised rim is absent at the front of the bottom board to make a gap between the board and the lowermost box. The bees use the gap as the colony entrance (Figure 1). Bottom boards composed completely of wood are called "solid" bottom boards. This is distinguishable from "screened bottom boards" which have a wooden rim but 8-mesh screen (8 wire squares/inch) internal surface (Figure 11). Screened bottom boards are used as a cultural control for Varroa mites and to reap other reported benefits.

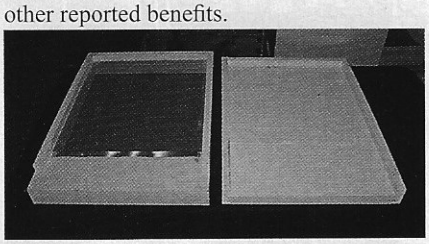

Figure 11: The hive bottom board. Bottom boards typically come in two styles: screened (left) and solid (right). (photo – Jamie Ellis, University of Florida)

Conclusion

It is worth noting that there are other parts to the Langstroth hive that I did not discuss. I focused my discussion strictly on the most common components of such a hive. I will also note that hives traditionally have been made almost entirely out of wood. Today, however, hive parts may be composed of plastic, Styrofoam, etc. One of the things that I will try to do throughout my articles is to convince you that beekeeping is an art; therefore, there are no right-or-wrong ways to do most of what we as beekeepers do. I discussed herein the standard, 10-frame Langstroth hive. However, it makes no difference to me if you elect to use 8-frame equipment, only shallow supers, plastic frames, etc. After all, beauty is in the eye of the bee-holder and I hope you are able to hold lots of bees☺

Honey Bees 101: "Honey bee" or "honeybee"?

The word "honey bee" can be found written in the popular and scientific literature as one or two words. Most spell checks, in fact, remain utterly confused. So, which is it: "honey bee" or "honeybee"? You might be surprised to know that there is an answer!

The Entomological Society of America (ESA), through its Standing Committee on Commons Names of Insects, has outlined rules for ascribing common names to insects. Point #4 under ESA's "Rules and Guidelines for Proposing a Common Name" reads:

"4. Most names have two parts, one indicating the family or group, and the other a modifier. In the case of names having two parts with one of them being a group name as given in Section IV, the group name will be a separate word when used in a sense that is systematically correct, as in "house fly" and "bed bug." If the group name is not systematically correct, it must be combined into a single word with a modifier, as in "citrus whitefly" and "citrus mealybug." The modifying part of the name should be based on some outstanding characteristic of the organism itself, its damage, host, or distribution. Hyphens between modifying words should be used only if the meaning is otherwise obscure." See **http://www.entsoc.org/use-and-submission-common-names** or **http://www.entsoc.org/pubs/common_names** for more information.

The meaning of this is somewhat confusing but the implication is clear. Insect common names often have two parts. If the insect group name (in our case "bee") is systematically correct, then the modifier ("honey") should be a separate word. In other words, if the organism is what the name says it is, the name should be two words. For example, butterflies are not flies so the common name is spelled as one word. Ladybugs are not bugs (they are beetles), so their common name is written as one word. Luna moths are moths so the common name is written as two words. ***By extension and application, honey bees ARE bees so the common name should be written as two words***!