Chapter 2.
Objective (The Brief)

This book is not an attempt to teach beekeeping, but to say why the ZEST hive is a good choice to make for keeping bees. It remains a work in progress. When you are down the pub or at the bee association you can amaze your friends, comrades and the barmaid with your results. She may even want to take you home.

They may all be less than totally believing about the honey you have collected, how disease free and easy your bees are to manage with their good temper, and at such little cost. They may begin to see you as a Walter Mitty fantasist. Tell them to get their own ZEST and prove it for themselves.

As a beginner you will have been taught on the usual wood hives hearing the lessons that your teachers heard. As a thoughtful beekeeper you will realize the limitations. This will have been good experience as bad experience is the best you will get. It teaches you more. Better however to use someone else's bad experience like that of the author. Beginners usually lose swarms from bad tempered colonies in their first year (I did), the remainder of which get disease in the winter (mine did). Many give up. Do not allow this to happen. The world needs ZEST beekeepers to save the planet, its ecosystem, put honey on toast and fruit in the bowl for the kids.

Considerable sums of tax-payer's money are spent on matters such as sequencing the genome of the bacteria that causes EFB and The Waggle Tail Dance. A search for the "hygienic" bee spends more. EU money is tipped into a project that will monitor bees via a satellite link to the beekeepers living room. It is a puzzle to know just what the benefits of all this expenditure is except to keep scientists employed doing their Phd's, paying off their mortgages and sending their children to private schools. While all this has been going on, my bees and others had been dying quietly and in quantity from Nosema during the winters. This is the principle cause of winter losses in traditional hives, because Nosema flourishes in a cold, damp environment. We all know this. Money could be spent more effectively on the down to earth question of making a better hive design.

The industry that sells bee keeping equipment and the academics that run courses on how to do it have a personal, but undeclared interest in maintaining the status quo, however flawed. They control the agenda, but are unwilling to accept that change is needed. This book accepts that need and explains the best way forward being of science, but also of design. The hives we currently keep our bees in kill them.

Honeybee Diseases

1. Nosema – Thought to be caused by a virus, but latterly thought to be a fungus! It is known to be exacerbated by cold and damp hive conditions in winter. The removal of Fumidil B from the market which acted as a palliative for the disease may lead to more Nosema in our bee stocks. Prevention rather than cure has now been made compulsory. The solution is to make the bee environment warm and dry rather than cold and damp.

2. CCD (Colony Collapse Disorder). Some of the latest thinking on the cause is expressed in the BFA Bulletin of June 2010.
   It suggests that Nosema *combines* with a fungus to collapse the colony.
   SAN DIEGO, CA – May 25, 2010 -- New research from the United States Department of Agriculture (USDA) identifies a new potential cause for Colony Collapse Disorder in honeybees. A group of pathogens including a fungus and family of viruses may be working together to cause the decline. Scientists report their results today at the 110th General Meeting of the American Society for Microbiology in San Diego.

   There might be a synergism between two very different pathogens, says Jay Evans of the USDA Agricultural Research Service, a researcher on the study. When they show up together there is a significant correlation with colony collapse disorder

   To better understand the cause of these collapses, in early 2007 Evans and his colleagues collected bees from both healthy and declining colonies across the country but primarily from California and Florida where most of the commercial pollination activity takes place. They have screened these samples and similar samples from each year since then for both known and novel pathogens.

   They found a slightly higher incidence of a fungal pathogen known as Nosema ceranae in sick colonies, but it was not statistically significant until they began pairing it with other pathogens.

   Levels of the fungus were slightly higher in sick colonies, but the presence of that fungus and 2 or 3 RNA viruses from the family Dicistroviridae is a pretty strong predictor of collapse, says Evans.

   Nosema are transferred between bees via the fecal-oral route. When a bee initially ingests the microbes and they get to the mid-gut, they harpoon themselves into the gut wall and live inside the epithelial cells there. Evans believes that the slightly higher numbers of the fungus somehow compromise the gut wall and allow the viruses to overwhelm the bees. In colonies with higher Nosema numbers they found virus levels to be 2-3 times greater than healthy colonies.

   While this is a working theory and they are still in the discovery phase looking for new pathogens, Evans and his colleagues are also actively looking for a way to boost bee defences against Nosema.

   A way to protect against Nosema might be the key for now, says Evans.

   A reasonable alternative theory is that CCD is caused by inbreeding. There are only 49 queen genetic lines in the USA all of which are imported. Honeybees are not native, all being immigrants. CCD is the classic sign of inbreeding. This is discussed in the Queen Breeding section of the **Management Chapter 5.**

3. Acarine – Seen in the spring and also described as K-wing. It is caused by a tracheal mite.

See Page 7 of “The Beekeepers Quarterly” No.95 March 2009 where John McMullan Ph.D of Trinity College Dublin writes on Page 7.
“In sub-tropical regions of the world tracheal-mite infestation levels can be very high, but the colonies will not normally die. Only in regions with cool winters do deaths normally occur. It has only recently been identified (McMullan and Brown, Exp. Appl. Acoral., in press) that the mechanism causing death in tracheal-mite-infested colonies is the inability of the colonies to thermo-regulate”.
Reducing the difficulty for the bees in thermo-regulation of the hive in a cold climate may be the way forward, which may enable bees to live with the tracheal mite and not be affected.

4. Varroa – While this is not a disease, but a mite, it is the vector for enough diseases to collapse the colony. In a climate that is cold in winter, into which varroa has moved as an alien species, its numbers appear to have increased from mathematical stability to exponential expansion. Its numbers are determined by it having enough time in the pupating bee cells to itself mature.
Reducing this pupation period may be the way forward.

5. European Foul Brood – This is caused by a bacteria living in the larva gut and which eats the larval food. The larva starves and dies. It decays, giving the characteristic foul smell of putrefaction. It was thought to be a disease found more in heather areas which are on acid soil, but the Random Apiary Surveys (RAS) have disproved this. It is unknown for certain whether cold and damp exacerbates the disease, but its incidence increases in summers that are cold and damp as in the summer of 2012.
The cure when found is:-
   a. Destruction of bees and brood with petrol, burning of frames and scorching of boxes. This is reserved for serious cases.
   b. Shook swarm in which only the adult bees are kept and put onto new frames. The old frames are burnt. Success rate is about 80%.
6. American Foul Brood. - Rare, but deadly. This has only one possible cure. Unlike EFB it is one of destruction and burning and has, perhaps as a consequence, been virtually eliminated in the U.K.
7. Chalk brood. – A fungus carried by the queen which is a variable visitor to a colony. Traditionally cured by re-queening, but can suddenly just disappear as the queen shakes it off.

This treatise is primarily about bee health and how to improve it with a hive design that is less cold and damp. The disease problems caused by cold and damp is perceived as being down to the hive architecture. While dealing with that on bee health grounds it became apparent that traditional hives are a costly Victorian anachronism best replaced by the ZEST principles of habitation design.
Cross top trickle ventilation and bee entry in the ZEST directly removes damp, carbon dioxide laden air while maintaining the brood cluster temperature below. There is no flue/stack effect cooling the colony, because there is no air inlet at low level. The ZEST insulated external hive envelope also reduces the temperature

difference between the inside and outside of the hive allowing the bees to thermo-regulate the brood more easily……..their prime ambition for colony brood survival.

Readers can draw their own conclusions on this thesis. They may choose to switch to ZEST hives, whether as a beginner or with experience, or to remain wedded to the existing technology and wood or polystyrene designs. While there continues to be no laws against cruelty to bees the choice remains yours…… No pressure.

This is the statement, not about designing a better mousetrap, but a better beehive. This is the brief, but what constitutes better? It is doing **"More with Less"** using **Design/Science**. How can we get more honey…..and by implication……more pollination with less energy and materials, than we do at present? Once this broad objective is stated we cannot simply do a lot of pointing and instruct the bees to comply and provide. We need to gain a deep empathy with the bees to understand what makes them want to naturally co-operate in our ambition. The relationship is one of mutual symbiosis. Our task is to provide good quality housing, a health service and food when there is famine. There is a school of thought in "natural beekeeping" that this includes letting bees succumb to "natural diseases" when we "unnatural humans" could prevent them doing so. We seem to have trouble accepting that we humans are also natural and deserving of our place in the Universe together with our ambitions for bees, which are entirely supportive.

What honey bees want from the beekeeper, as far as possible is to be **Warm and Dry** and:

a) Be disease, pest and parasite free.
b) Behave naturally.
c) Fill the Universe with their kind.
d) Nurture their young at 35°C.
e) Have adequate accessible food and water.
f) Have a hive secure against weather and predators.
g) Be kept busy doing productive things such as drawing wax.
h) Not be overcrowded, but to have a compact brood nest.
i) Be free of insecticides
j) Have a prolific Queen, mainly found in her first year.
k) Not to have pollen or honey blocks preventing the Queen laying eggs.

Most of the "bee wants" above are not readily met with thin walled hives. If these wants are met the bees will be quieter, harder working and better tempered as indeed we are when our needs are easily met.

What beekeepers want from the bees is to be:

a) Productive, making a surplus of honey for harvesting at minimum cost.
b) Good tempered.
c) Disease free.
d) Pollinate crops.
e) Able to brag about the honey they harvested and how many colonies survived the winter.
f) Not be stung, injured, tired or made uncomfortable.

3 data loggers were deployed during 2017 in a traditional B.S. National wood hive, a ZEST and an ambient environment for comparison that measures temperature and relative humidity in those environments.
The results are shown in the Research Chapter in the form of graphs with observations and discussion, but you are invited to make your own insights on the information provided.

Temperature, humidity, evaporation, condensation and ventilation are the methods that the bees use to maintain a constant brood nest environment**.** We can help them here if we do not prioritize value laden good taste of cedar hives over utility.