Chapter I

Key Concepts

What should you NOT eat?

Sometimes foods that we think are healthy come with a surprising health risk. Mercury in some fish comes to mind. Or aspergillus, a fungus that causes liver cancer, in some peanut butters. Soy and meat were thought to be healthy and unhealthy, respectively, but data has shown this to be more complicated than generalities. Even omega-3 fats and water, things we have come to think of as 100% iron clad safe, can kill when consumed in large amounts. Deaths from over-consuming water include a pledge during a fraternity hazing as well as a woman in a radio-show competition; each drank at least 2 gallons in a short space of time. Omega-3 fats, arguably the healthiest molecules calorie for calorie that you can put into your body, reduce heart disease and inflammation in the small amounts consumed in a healthy diet, but can contribute to heart disease when consumed in large amounts, such as when over supplementing. Clearly, whether or not something is toxic depends partly on how much of it is being consumed in a short space of time. Below are lists of toxins ranked by how much you would need to regularly consume before you risk negative effects at some point in your life:

Relatively toxic in small amounts

- Mercury in some fish (including tuna), carcinogens in some farmed salmon
- Aspergillus, a mold that grows on nuts and other legumes when stored in warm, humid conditions
- Trans fatty acids i.e. partially hydrogenated vegetable oils

Toxic over time when greater than ~10% of total calories in the diet

- Fats from most (unnaturally raised) animals & animal products (as opposed to plant saturated fats)
- Refined carbohydrates: Sugar, including sweeteners, such as organic evaporated cane juice, honey and agave nectar. White carbohydrates such as white bread, white rice and white pasta. Potatoes (e.g. chips or fries, which often contain unhealthy fats). Ground corn (e.g. chips or breakfast cereal).

In theory already toxic in small amounts but in practice perhaps only toxic in typical amounts

- Burning food such as during barbecue, high temp frying, or toasting
- Low-calorie sweeteners derange gut bacteria, inducing insulin resistance

Toxic when consumed in larger amounts

- Supplements: Some vitamins, minerals, essential fats, and fiber
- Food additives: Salt (i.e. sodium), preservatives (e.g. nitrates), and low-calorie sweeteners
- Excess of any one macronutrient: Excess protein, fats, carbohydrate or water can all be dangerous

Why eating has become complicated

The emotion center in our brain rewards us for sugar, fat, and satiety in general. So we like getting full on sugar and fat. Selling sugary fatty foods has become such a good business plan that it is now difficult to eat out without being served meals containing very few nutrients other than what tastes good and in large amounts. In the same category are fast foods for the home, including chips, energy bars and many microwavable meals. Without making a deliberate effort to be healthy, our food environment almost ensures our failure at achieving nutritional health.

In response to the national epidemic of obesity and related diseases, Americans have been searching frantically for the nutritional root of all evils: Is it the fats we are eating? Is it the carbohydrate? Should we just eat protein? Or perhaps we should eat whatever we want but purge our body every few weeks? What is lost in this random targeting of one aspect of diet this year and another the next, or "fad dieting," is the fact that the foods we eat work together as a TEAM to make us healthy. Except in the case of foods that contain toxins, there are no foods that are inherently evil. This lack of absolutes when it comes to what we should or should not eat adds to our confusion in trying to get healthier.

Consider the following examples

- If you eat carbohydrate with or after eating a big salad, the sugars in the carbohydrate enter the bloodstream slower because the salad slows down digestion. This results in fewer carbs going to body fat because muscle and other active tissues have more time to absorb them. In other words, you make bread and dessert healthier by eating them with or right after a salad. This is part of the reason that I personally like salad so much. It allows me bread or dessert while still providing a higher quality of life both short and long term.
- Bananas digest faster than most other fruit. If you have the banana on cereal made from ground corn or wheat, which also digest quickly, the problem is compounded and you gain body fat from the rush of carbs entering your body. But put the banana on a coarse cereal (like oats) or with nut butter on a slice of coarse grain bread, and digestion will be slower, making the snack healthy.
- Animal fats can contribute to heart disease, but the effect is only conclusive when the fats are oxidized (processed) and when unsaturated fats are absent in the diet. In other words, egg yolks, bacon, steak, fatty dairy and even ice cream are absolutely fine to eat in moderate amounts as long as they are high-quality there are unsaturated fats included in your day.
- Juice might be high in nutrients, but less than half of the original food and it processes very fast.

What do we mean by "healthy diet"?

Eating a diet that improves quality of life is not as simple as buying an organic food bar and having it with a glass of spring water. The body requires a broader spectrum of foods than we currently understand. Science has generated lists of vitamins, minerals and other essentials needed for optimum physiological function, and yet when we supplement with these things, they are never as helpful to our health as when we obtain them from natural food. As an example of how supplements can backfire, it was shown in a prospective study that supplementing with 3.5 g fiber per day increases colon cancer risk by 67% [Faivre J et al, Lancet 356 (2000) 1300]. Is this because fiber supplements have fewer antioxidants and more free radicals than the foods they came from due to processing and storage? We don't know the answer yet. Why do other supplements also not hold up to our expectations?

- Do the nutrients in natural food work together (symbiotically) in some way to improve our health?
- Do foods contain things we have not yet discovered to be important?
- Maybe the large amounts of individual compounds in supplements are overkill
- Maybe processing oxidizes antioxidants into free radicals and healthy fats into rancid fats

While oxidation during processing is inevitable, answers to the rest of these questions are not clear at the current time (techno-speak for we have no idea what is happening). Ongoing research will provide more decisive perspective on the human body's needs with time, although research will always fall short of providing enough data for our complete understanding. Instead of waiting for conclusive data that will never arrive, we can take what we know at face value and apply it immediately to improve our quality of life: A broad spectrum of nutrient-dense natural foods provides a complexity of nutrition beyond what we currently understand, and this complexity matches the complexity of human health needs. On the flip side of this, concentrated processed compounds that we think might help us in supplemental form can actually hurt us. As a result, what we mean by "healthy diet" has less to do with eating what we know is healthy, and more to do with eating in a way that results in our being healthy by accident (without our complete understanding). Eating what results in our being healthy is NOT an exact science, but rather an approach to eating consisting of the following three things:

- Not eating too much of any one thing to avoid toxicity
- Eating the things we know to be important in their natural food form when possible, and
- Eating a broad spectrum of foods, not just what our limited knowledge tells us to be important

To improve health, we'll first look at what we are up against: What is shortening our lives?

The American mortality profile is correlated to body fat

Below are the top causes of mortality in the US, the average number of years that each disease takes away from its victims, and how many life-years total are taken from the entire US population each year by each disease (CDC data). Note that over half of deaths in the US are due to either heart disease or cancer, taking over 10-15 years of life on average from each victim. The CDC calculates the years of life lost assuming a 65-year life expectancy. The actual life expectancy in the US is currently 79 years, which includes infant mortality, meaning that adult life expectancy is higher. In other words, disease victims lose at least 10 years more than the CDC indicates, meaning that victims lose an average of 20-25 years of life; **(the corrected values are in parenthesis below)**. The diseases in **BOLD AND UNDERLINED** are those associated with being overweight.

2010 top killers	# of deaths	Years taken from each victim 2004		Total life years lost in the US each year
1. **Heart disease**	597,689	11.6	(21)	8,000,000
2. **Cancer**	574,743	15.6	(25)	8,700,000
3. Respiratory disease	138,080	11.8	(22)	1,500,000
4. **Stroke**	129,476	10.5	(20)	1,700,000
5. Accidents	120,859	32.0	(42)	3,500,000
6. **Alzheimer's**	83,494	7.0	(17)	400,000
7. **Diabetes**	69,071	14.4	(24)	1,100,000
8. **Kidney disease**	50,476	12.1	(22)	500,000
9. Influenza and pneumonia	50,097	10.3	(20)	700,000
10. Suicide	38,364	34.0	(44)	1,100,000
11. Septicemia (infection)	34,812	14.0	(24)	500,000
12. **Liver disease**	31,903	22.5	(32)	600,000
13. **Hypertension**	26,634	8.0	(18)	100,000
14. Parkinson's	22,032	0*	n/a*	9,000*
15. Assault (homicide)	18,573	45.5	(55)	800,00

*Parkinson's is thought by many health care providers to reduce lifespan, but estimates vary from 0-2 years of lifespan reduction. The value has not been determined with any accuracy and the CDC does not provide an estimate.

It matters where your body fat is located

Eight of the top fifteen mortalities in the US are correlated to being overweight. However, much of the research showing these correlations estimate body fat levels using Body Mass Index (BMI), which is the ratio of a person's weight to the square of their height in units of kg/m^2. BMI does not take into account how a person's fat is distributed in their body. Nor does it account for larger than normal amounts of lean tissue, so weight lifters can have a high BMI even if they have very little body fat.

Estimates of BMI levels for the general US population indicate that 2/3 of us are overweight, and that half of those 2/3 are obese. Even with confounding factors such as lean weightlifters, BMI is a useful indicator of a general trend towards increasing levels of body fat in the public over time. However, when assessing the health of an *individual*, not only does BMI not distinguish between large amounts of muscle and large amounts of fat, it also does not tell us how a person's body fat is distributed. A baby has little fat accumulation in their arteries, but they have a high BMI because of their high levels of subcutaneous fat. On the other hand, a thin person who eats relatively few calories but whose diet consists of refined carbohydrate and/or saturated fat can have a significant about of arterial fat, putting them at risk for circulatory diseases, such as heart disease, stroke, and hypertension (mortalities 1, 4 and 13). Alcoholic liver disease is associated with very high levels of fat in the liver where alcohol is metabolized, even though some of the disease's victims eat very few calories and are extremely thin. The bottom line is that ***what*** a person puts into their body can result in fat accumulating in the worst places regardless of whether the person looks overweight, thin, or even cadaverously thin. Disease risk does not come simply from being "overweight".

Consider that the following diseases are most highly correlated to specific ***types*** of body fat:

- Circulatory diseases are correlated to fat accumulation in the walls of arteries called atherosclerosis
- Kidney and liver disease are correlated to fat accumulation within those specific organs, which generally but not necessarily occur coincident to fat accumulation elsewhere in the body
- Diabetes is correlated to visceral fat (although if under-eating it might not accumulate much)

In the case of cancer risk, inflammatory signaling processes that occur from excess body fat and from a poor diet are detrimental. Poor diet in this case means an excess of carbohydrate and/or saturated fats and a low intake of phytonutrients in natural foods (as opposed to supplementation). Not only is a poor diet problematic, but the type of fat accumulation from a poor diet is also directly problematic.

It is NOT just about how you look in the mirror

- **The worst place to have body fat:** In your organs, including your arteries, kidneys and liver. This occurs from most animal products and from processed carbohydrate (whether whole grain or not).
- **Also a bad place to have body fat but not as bad as in the organs:** In your torso, between and around your organs, or viscera. This is known as "visceral fat", abdominal fat, or the omentum. Visceral fat levels are driven up by the same things that increase organ fat.
- **The best place to have fats is under your skin over your entire body.** This is called subcutaneous or 'sub-Q' fat and is the type of fat a person has when they are newly born (i.e. "baby fat").

How do you know what type of body fat you have?

The best way to determine your sub-Q versus visceral body fat distribution is by low-energy X-ray (DXA) or magnetic resonance imaging (MRI). But there are simpler ways to tell where your fat is:

- Look at your waist size, not just your weight. Visceral fat will make your belly stick out.
- If you have visceral fat, you are likely to have organ fat accumulation.
- However, being thin does not mean that you do not have organ fat accumulation. Look at your triglyceride, LDL cholesterol (relative to HDL) and blood pressure levels.
- If you exercise a lot or restrict your calories and are therefore thin but eat a lot of processed foods such as sports supplements and refined carbohydrates, you are at increased organ fat risk.
- Sub-Q fat will dominate when you are not very overweight and your body fat is evenly distributed. The only time in life that sub-Q fat can be high while other types of body fat are low is in infancy, or when slightly over-consuming extremely healthy foods over long periods of time.

Can you control where your body fat accumulates?

Yes, in a limited sense. Refined carbohydrates and most animal fats contribute relatively more to organ and visceral fat than to sub-Q fat compared to unprocessed carbohydrates and unsaturated fat. For example, eating a healthy salad before a meal slows the digestion of the meal, reducing body fat accumulation from that meal. And exercise burns visceral fat faster than it does sub-Q fat. Thus, if a fit person eats a few too many healthy calories on a regular basis, the vast majority of their body fat will be sub-Q: They would be, in terms of body fat distribution, like a big baby, and their disease risk would be low. This makes the concept of "fit and healthy at any size" powerfully correct. However, while an overweight person (defined as having a BMI of >25) might eat well enough and be rigorously fit enough to have mostly sub-Q fat, but it less likely that an obese person (BMI >30) could do so.

Can a diet specifically target a reduction in visceral and organ fat?

Yes, also in a limited sense. Organ fat accumulates not primarily from being overweight per se but from calories entering the body quickly. Because the liver is the first organ to see the calories entering the bloodstream from the intestine, and because visceral fat surrounds the intestines, they accumulate relatively more calories than the rest of the body when calories rush into your body from digestion. Visceral fat bulks up while the liver responds by creating triglycerides and LDL cholesterol. Sub-Q fat and your other organs are next in line at the buffet and absorb the rest. Sub-Q fat bulks up less than visceral fat when calories enter fast. When calories enter the bloodstream slowly, visceral fat and the liver never gorge themselves and all the tissues in the body get their equal and fair share of your meal. Refined carbohydrates digest quickly whereas protein, fat, and unprocessed carbs digest slow. This is the reason why many people who initiate a high protein diet after years of eating processed carbs see improvements not only in their BMI but also in their blood lipid profile. However, a high protein diet presents a higher organ fat risk compared to a diet containing unprocessed carbohydrates. Unprocessed carbs include whole grains not ground into flour, whole fruits and whole vegetables. Vegetables contain less than half the calories and at least twice the fiber and phytonutrients per gram compared to whole grains and whole fruits. Therefore, a diet that is serious about reducing visceral and organ fat will contain a significant amount of vegetables…on the order of 25% of the total calories, which is at least half of the volume of each lunch and dinner.

Including unsaturated fats and reducing low-quality animal fats in the diet is the second key step for reducing visceral and organ fat levels. The combination of higher unsaturated fat and vegetable consumption within a generally balanced diet containing natural unprocessed foods serves as the cornerstone of the healthiest diets throughout the world. That makes sense since unprocessed foods are natural history. It is the developed world that processes foods, eats it, and ships it worldwide.

The solution

Keep animal fats and refined carbs each to less than ~10% of total calories. Replace any amount beyond this with unsaturated fats and unprocessed carb, particularly fruits, legumes and mostly (by volume) vegetables. Because vegetables have less than half the calories and over twice the fiber and phytonutrients of whole grains and fruits, vegetables are the centerpiece of a diet targeting reduced digestion rate and increased cellular health, the two mechanisms of the Muscle Versus Fat Principle. Together with healthy fats and protein, natural carbs make up what I call “The Bucket Brigade”.

The Conveyor Belt or Flow Model for health and fat loss

Your circulatory system is a conveyor belt or flow of nutrients to your cells, giving you energy, mental focus and health. When you eat or drink, the food and fluids go into your digestive system, which deliver nutrients to your blood, the conveyor belt. The more you eat, and the more processed the food, the faster it dumps onto the conveyor belt. Whenever nutrients dump onto the conveyor faster than they can be absorbed and used by cells, nutrients overflow off the conveyor into waste and/or body fat. Our goals are to (1) NOT OVEREAT, (2) eat SLOW DIGESTING food, and (3) increase cellular HEALTH so our cells take nutrients from the conveyor at a faster rate. All these avoid an overload onto the conveyor. Slow-digesting foods are more filling, making it less likely that you will overeat (as much), and since they are less processed they are inherently healthier. Unprocessed foods take care of all three targets. As does adding vegetables to any less healthy processed meal.

1. Reducing the number of calories you eat in a meal: There is a hard way and an easy way to do most things in life, and reducing calories is no exception. Unprocessed foods fill us the most, vegetables in particular, but no matter how full you are, cravings or social or other forces can keep you eating. Later I will discuss things shown to reduce caloric intake "spontaneously" i.e. without intentionally trying. "What, When and Water" go a long way towards this goal.

2. Slowing down digestion: Protein and fats in a meal result in a hormonal response that slows stomach emptying and therefore digestion. Unprocessed foods (particularly vegetables) slow down digestion mechanically because they increase the stomach's workload as it breaks down the meal.

3. Increasing cellular health so nutrients are absorbed from the blood faster: When calories enter the bloodstream quickly, active tissues protect themselves from over-fueling by REDUCING how much they absorb. In other words, active tissues REDUCE how much they absorb when their absorption capacity is exceeded. The ironic and sad result is that the faster sugars (in particular) enter the bloodstream, the LESS goes to muscle and the more goes to fat. The process by which this occurs is called insulin resistance, and it is also caused by excess protein or saturated fat in any one meal. Insulin resistance occurs in less than one-half hour after an unhealthy meal and persists for more than 4 hours afterwards. This immediate reduction in muscle fueling, with more necessarily going to fat, is called meal-induced insulin resistance. Regularly eating meals that induce this overflow leads to changes in gene expression, gut bacteria, and brain processing that makes change harder later on.

Optimizing your conveyor belt's flow balance between supply and demand: WHAT TO DO

- **Reduce hunger and therefore how much you eat:** Vegetables are the key to reducing hunger immediately during a meal so that excess calories are not consumed. Fats and protein contribute to satiety but reduce hunger the most 20 minutes or more after the meal starts. If you are physically active and do not include unprocessed carb calories, your blood sugar will be low and a few hours after eating a large meal you will still be hungry.
- **Reduce the digestion rate so that calories enter the bloodstream slower:** Fats, protein, and unprocessed carbohydrates all slow down digestion, but vegetables are by far the strongest.
- **Increases the rate at which active tissues absorb fuel:** A steady, consistent availability of all the things your cells need, around the clock, is what optimizes their health and therefore metabolic rate. The less processed your foods are, the slower the digestion and the more drawn out is the nutrient availability. The higher cellular metabolic rate (equating to your metabolic rate) is what drives up the absorption rate with time as you eat healthier. The opposite scenario is the vicious cycle of unhealthy foods shutting down your cells so that each successive day your body has a worse response to the unhealthy foods.

In looking at the foods that positively effect each of the three goals (reduced hunger, reduced digestion rate, increased fueling of active tissues), we see that there are three food components that assist us in each: Unsaturated fats, moderate levels of protein intake, and unprocessed carbohydrate. In other words, these foods work together in a meal to reduce body fat while simultaneously increasing energy and health. Any ratio of these components put together in a meal provides a benefit, but one way to start is on your quest of finding what works best for you might be an equal amount of each of the below groups. The relative amount can vary depending on your culture, personal preference, physical activity levels, genetics, or any of a number of other factors. Because of the different types of fuel in starches relative to fruits and vegetables, I separate those out from each other:

The SIMPLEST approach: 25% of each food group in each meal

- Unsaturated fats twice as much as optional saturated fats: total fat intake 20-50% of Calories
- Moderate levels of protein intake: 10-25% of total calories
- Vegetables: 25-50% of Calories, which is at least half the volume of every lunch and dinner
- Unprocessed carb calories: 0-50% of Cal (none needed if you are sedentary), using starchy legumes (lentils and beans) and whole fruit as your main sources, and starch right after exercise

What, When and Water

WHAT to Eat: Meal Composition

- **The perfect conveyor:** Unsaturated fats, moderate protein, unprocessed carbohydrate (legumes, fruits and vegetables). Recipes and grocery lists using these food categories help guide your eating.
- **Fill the conveyor with vegetables:** This will improve your quality of life more than any other single nutritional change you could make. They are highest in nutrients, bulk, and slowing-power.
- **Nutrient density:** The conveyor concept helps you naturally reduce caloric intake and eat balanced meals. However, a meal that includes iceberg lettuce as the vegetable, blackened steak as the protein, bread containing trans fats as the carb, and oxidized (heated) vegetable oil as the unsaturated fat is a meal that leaves a lot to be desired even though it technically meets all the requirements of the conveyor concept. Balance is not enough. The foods you eat must have a high nutrient density, and a low density of toxins, in order to achieve the highest quality of life. Higher nutrient density also allows you to eat less with less risk of malnutrition. Research studies of other species show that under-nutrition (caloric restriction) prolongs life as long as that eating less does not result in malnutrition.
- **Toxins:** It matters as much what you do eat, as what you do not eat.

WHEN to Eat: Caloric Pacing

- The body is not particularly good at storing protein, carbohydrate or water, so it is a good idea to get a bit (not too much) of each of these a few times per day i.e. in each of your regular meals.
- Meals should be spaced out so that the body spends as little time as possible in the starved state.
- Larger meals (excess calories at one time) simply increases body fat levels, and 6 hours later more food must be consumed to sustain optimal health because blood sugar and free amino acids are dropping, irrespective of the excesses consumed earlier.
- Eating balanced meals evenly spaced through your day provides “caloric” or “nutrient pacing”

Water: The Medium for Everything That Happens in Your Body

- Proper hydration increases metabolism, cell growth, digestion, and facilitates every biochemical process in your body.
- You need roughly 1 Liter or quart for every 1000 Calories that you eat, and this water should be spaced throughout your day since the body cannot store water reserves.

DRI and RDA

The Dietary Reference Intakes (DRIs) are the most comprehensive, unbiased and scientifically based guidelines on human dietary needs available. The DRIs are published in a series of 12 books, most of which are 300-1200 pages in length. There are different types of guidelines (listed below) for different nutrients, depending on how well (accurately and precisely) human nutritional needs can be defined. The quotes denote the exact definitions as stated in the DRIs.

The types are DRIs are:

- **Recommended Dietary Allowances (RDAs)** are the levels of nutrients "sufficient to meet the nutrient requirement of nearly all (97-98%) healthy individuals."
- **Estimated Average Requirements (EARs)** are "the average daily nutrient intake level estimated to meet the requirement of half the healthy individuals in a particular life stage and gender group." EAR plus two standard deviations is the RDA.
- **Adequate Intake (AI)** values are "the recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate—used when an RDA cannot be determined." In other words, AIs are estimates of how much apparently healthy individuals eat of some nutrient, the assumption being that they must be eating enough of it since they are healthy.
- **Tolerable Upper Intake Level (UL)** is "the highest average daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all individuals in the general population. As intake increases above the UL, the potential risk of adverse effects may increase."
- **Estimated Energy Requirement (EER)** is "the average dietary energy intake that is predicted to maintain energy balance … consistent with good health."

The DRIs and RDAs are free on line at the National Academies Press web site: www.nap.edu
Simply type "dietary reference intake" into their search box and all the texts come up, which you can then bring up individually and read. The older RDAs are also available for free online. These are fantastic resources.

150 lb is our average relatively lean weight (excluding excess fat)

CDC data indicates that the average body weights for men and women 20-74 years old have gone up significantly between 1960 and 2002. During that 42-year period, the average weight for men went from 166 to 191 lb, and the average weight for women went from 140 to 164 lb, making the combined average roughly 177 lb. From a national health perspective, returning to the approximate mean body weight of 150 lb for all adults in 1960 is an obvious desirable future endpoint. But in the meanwhile, in estimating our nutritional needs, since the increase in body weight is mainly fat, we can use 150 lb as our average weight even though the real number is higher. Fat increases our metabolic rate a bit (although it likely accumulated from the loss in metabolic rate in much higher metabolic tissues, with a net loss). Ignoring the small metabolic need of excess body fat therefore represents a slight caloric restriction. The bottom line is that, with a slight caloric restriction, nutrient needs can be reasonably estimated from our "healthy" body weight, even if we are a bit heavier than that. The "average" person (men and women combined) for estimating average nutrient needs would then be 150 lb, adjusting up or down based on your weight or what your approximate "normal" weight would be.

When 'calories' is capitalized it means kcals

A calorie is 4.19 Joules, the amount of energy required to raise the temperature of 1 gram of water by 1 degree C from 14.5 to 15.5 C at 1 atmosphere of pressure. When calorie is spelled with a capital 'C' i.e. 'Calorie' or 'Cal' this is meant to indicate 1000 calories, which is the same as a kilocalorie (kcal). The calories listed on food labels are actually Calories or kcals. When you see calories not capitalized the word is meant to simply represent the concept of energy in food e.g. "eat more calories", whereas Calories capitalized is meant to represent a specific amount of food energy e.g. "eat 100 more Calories.

All models are wrong, but some are useful

A 20th century theoretical statistician (George Box) wrote a 1978 statistics paper entitled "All models are wrong but some are useful." Elsewhere he wrote that "Since all models are wrong the scientist cannot obtain a 'correct' one by excessive elaboration…[instead] seek an economical description of natural phenomenon." But, from an approximate quote of Einstein: Everything should be made as simple as possible, but not simpler. So we need enough complexity in our model for it to be useful, but not any more complex beyond that since the model (and all models) are wrong anyway. They are not facts; they are the diagrams we have in our heads to help make sense of, or at least try to make useful, the data we collect. The models I present to make sense of data are no different.