REFLECTIONS

CHALLENGES TO THE CONVENTIONAL WISDOM

The following three reflections, which contain some original thoughts, made me aware of the "force of the conventional wisdom." Most original thoughts are nonsense, usually emerging from the minds of single issue fanatics who are convinced that their realisations are "the answer" and that everyone should take note. Everyone of any authority will have received original thoughts that are not worth consideration (my favourite was a cure for AIDS that entailed harvesting recently pollinated flowers that only grew on the top a certain mountain in South America). Sometimes there are clues to the nuttiness and **THESE INCLUDE THE USE OF GREEN INK AND BLOCK CAPITALS**. Because I am not a fanatic and these reflections emanated from whimsical speculation rather than revelations I sent copies to various relevant people. I rapidly became aware that some authorities have a vested interest in maintaining their status quo founded on previous paradigms and whose minds were essentially close for business. One journal that often prints hypotheses returned my weight regulation thoughts after considering them for three days! So what should one do when faced with such apathy? My answer was "Not much" because I had no vested interest in promoting my thoughts - people can take them or leave them. Nevertheless, for those who think they have thoughts of general importance, there is a problem of how to overcome the inertia of those who espouse the conventional wisdom. These people in my experience are like sea squirts that has a nervous system to enables them to squirt themselves around, but the moment they settle down "gets tenure" the nervous system atrophies (names of several professors not provided on request).

There were four main responses to my ideas
Firstly there were be *ex-cathedra* statements that there was not a problem to be solved. These objections usually came from those who, professionally, should have been aware of the problem addressed by the idea. From a human nutritionist "The Calorie system is not broke. It doesn't need fixing."

Secondly, as I am not an expert in the dietary field, I was be accused of adopting an over-simplified reductionistic approach because my idea (Carbon consideration were as important as Calorie considerations) involved knowledge of multiple specialist areas - surely a generalist could not see something they had missed "You don't understand the complexities."

Thirdly, some who failed to comprehend the basic idea used "fob off" techniques. Some quoted references they claim contradict my idea, seemingly hoping that I would not bother to read them. I said that taking tepid showers should cause weight loss if losing Calories were the only consideration. I was told "They do! See reference provided" but on reading the reference I discovered that people who take cool showers do lose Calories (course they do) but the quoter had assumed that this in itself without the need to lose carbon was sufficient to lose weight. Some others fobbed me off by suggesting a detailed fully referenced review of the background to dietary physiology. One even suggested I read all of a three inch thick textbook. One authority did not reply to e-mails asking for comments and, when prompted, claimed I did not answer major questions *that I had not tried to answer*. Seemingly oblivious of the point I was making they ask "Why do fat cells accumulate excess fat? Why do men and women fatten differently? Why does the fat accumulate above the waist in men and below it in women?

Finally, and appallingly, some will dismiss new ideas and retort without amplifying comment that the idea is "Absolute Bollocks" (to spare him embarrassment I will not mention J T's name in this connection). But to give credit where none is due, this response encouraged me to promote my idea rather than just publishing it and moving on to other things.

Has there been a confederacy of dunces or am I a dunce? You decide.

ARE CARBON CONSIDERATIONS MORE IMPORTANT THAN CALORIES IN WEIGHT REGULATION?
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Although Calories are a measure of energy, not of weight, Calories and thermodynamics are universally regarded as the crucial primary consideration in weight regulation. It is suggested that additional insights into weight regulation are gained if weight considerations, as seems logical, are the primary consideration. For a steady weight, total inputs of absorbed carbon must equal total output. Carbon input can be regulated by oral intake but significant regulation of output could occur by the invisible and thus unnoticed changes in respiratory carbon dioxide output. Indeed, unless there are changes in carbon excretion, carbon metabolism, genetic factors, or exercise do not provide explanatory mechanisms for weight regulation. Importantly, Calories can be retained or lost independently of weight (by heat loss from skin or by latent heat of evaporation of water in breath and sweat). The Calorie input diet paradigm should be replaced by an absorbable carbon content in absorbed food paradigm, perhaps best described as "critical carbon content."
Keywords. Weight regulation, carbon dynamics, ventilation.

1 INTRODUCTION

"The Calorie system is not broke. It doesn't need fixing." (conventional wisdom)

"Something else is going on here, and it is nothing to do with Calories" Taubes [1]

There is an almost universal misapprehension that dietary restriction of a defined number of Calories directly causes a defined weight loss. I hypothesise that carbon absorption and carbon excretion are the two major factors in weight regulation and that Calorie restriction, although related to weight loss, is of relatively less significance than generally thought, and that the role of respiratory carbon excretion is more significant than generally appreciated.

2 FUNDAMENTAL PRINCIPLES OF WEIGHT REGULATION

Ingestion, absorption, and excretion are the three mechanisms that influence weight regulation. To maintain a static body weight the combined input weight of nitrogen, hydrogen, oxygen, and carbon in absorbed carbohydrates, fats, proteins and water should equal their combined output weight. Other elements such as iron or calcium either constitute a small proportion of body weight or are relatively static and provide little opportunity for weight regulation.

The widespread focus on Calories for weight regulation is bizarre because Calories are a measure of energy, not of weight, and after production of energy using Krebs cycle the body still contains the same number of atoms (in fact slightly more atoms because a proportion of inspired oxygen has to be incorporated). There are other problems with Calories. Most studies comparing normal and overweight people suggest that those who are overweight eat fewer Calories than those of normal weight Taubes [1] (1). Weight changes seem to be independent of the Calorific value of some diets Hall et al [2] and independent of the carbohydrate or fat content of other diets, continued treatment of obesity by balanced Calorie-restricted diets is ineffective National Research Council [3], and "Fat people are not necessarily gluttons: some indeed are truly abstemious." Passmore and Durnin [4] No wonder that some authorities cannot be authoritative "low energy-dense foods …*probably* protect against weight gain, overweight and obesity. High energy-dense foods, sugary drinks, and fast foods "…*probably* cause weight gain, overweight and obesity (my italics). World Cancer Research Fund [5].

These and other "Calories-in-relation-to-weight inconsistencies" prompted Taubes to ask in his book The Diet Delusion "…why have clinicians always believed it necessary to semi-starve them (obese patients) with twelve to fifteen hundred Calories or even feed them very low Calorie diets of eight hundred Calories or less, to achieve any significant weight loss?" He then made the perceptive remark "Something else is going on here, and it is nothing to do with Calories." Taubes [1]. This mysteriously invisible "something" I will suggest is primarily the variability in the weight of carbon invisibly excreted as carbon dioxide in expired air. Carbon as a weighty element is, I suggest, mostly thought of as a constituent of opaque solids such as coal, grass, or trees rather than a transparent gas.

Elementary aspects of weight regulation

Nitrogen is ingested as amino acids and is excreted as urea and urea-like substances in the urine but the 24 hrly loss of urea is only 12-20 grams, equivalent to 5.4.-9.3 grams of nitrogen. With the exception of ketogenic diets, *vide infra*, manipulation of dietary nitrogen provides little opportunity for weight regulation.

Hydrogen is absorbed in water, carbohydrates, fats and proteins and excreted as water or in urea (0.8-1.3 grams 24 hrly of hydrogen).

Oxygen is ingested in water, carbohydrates, fats and proteins, plus oxygen in inspired air, and is excreted as water in urine and as insensible water losses in evaporation from the skin, in expired air, in the faeces, and in small quantities in urinary urea.

The combination of *hydrogen* and *oxygen* in water provides little opportunity for sustained weight regulation because drinking almost instantly reverses deficits and because continued dehydration is life threatening.

Hydrogen and oxygen-containing compounds (as well as nitrogen and carbon containing compounds) are also excreted in the faeces but, apart from therapeutically induced malabsorption, manipulation of faecal content provides little opportunity for weight regulation.

Carbon thus emerges as the only contender for weight regulation. Carbon is ingested in carbohydrates, fats, and proteins and excreted in relatively small amounts in urine (2.4-4.0 grams of carbon 24 hrly), from shedding of skin and from shedding of cells into the gut, but these losses are relatively stable and provide little opportunity for weight regulation. Metabolism of carbon-containing compounds produces water and carbon dioxide with almost all this carbon dioxide being excreted by ventilation of the lungs. Thus anything that affects respiratory excretion of carbon dioxide will affect weight. The average American contains about 21,000 grams of carbon, consumes about 183 grams of carbon 24 hrly and has relatively invariable loses of 22 grams 24 hrly in faeces, urine, flatus, sweat and aromatic compounds. Importantly about 161 grams 24 hrly of carbon in the form of carbon dioxide is normally excreted in expired air. West and Marland *et al* [6].

Ventilation is regulated by chemoreceptors and brain respiratory centres that respond to carbon dioxide and associated metabolic changes, including pH, in the blood. It has long been known that variations in the responsiveness of respiratory centres to carbon dioxide are considerable Østergaard [6]. It has also been known for decades that there is a large individual variation in respiratory responses to (inhaled) carbon dioxide concentrations Kellog RH [8] and that rises in ventilation occur to maintain normal carbon dioxide levels and are brought about when there is increased endogenous (metabolic) production of

carbon dioxide. The wide variations (between 5-8 litre per minute) of ventilation at rest provide further evidence of respiratory centre variability, demonstrating that some normal individuals may ventilate at five litres a minute, whilst others may ventilate at eight litres a minute, and others may vary their ventilation between five and eight litres a minute. Similarly the normal range of carbon dioxide pressures in the blood (35-45 mms Hg) again reveals a variation of respiratory centre tolerances to carbon dioxide.

Energy expenditure and weight reduction

On earth weight is equivalent to mass (the quickest way to lose weight, but not mass, is to go into freefall). Weight and energy are almost independent. $E = mc^2$ reveals that an enormous number of Calories would have to be produced to cause infinitesimal weight loss (at Hiroshima 120-150 x 10^{11} Calories were inefficiently equivalent to one gram of mass). Energy intensive exercise programs aimed at weight reduction will not in themselves be effective unless ingestion or absorption of weighty atoms is reduced or their excretion is increased. Importantly, energy output can be modified independently from weight considerations, being reduced by vasoconstriction to limit skin heat loss, or by vasodilation to increase skin heat loss. Even in non-infection related increases in basal metabolic rates are present, such as thyrotoxicosis with increases in Calorie production, the body manages to lose the excessive Calories and fever does not result. "Weight independent" heat loss can also be achieved by varying water evaporation in breath and sweat. Normally the 24 hour insensible fluid loss has a wide range, on average about 500 mls daily that yields an output of about 54 Calories.

Carbon metabolism without changes in carbon excretion does not provide an explanatory mechanism for weight regulation

Metabolic rates may vary, metabolism may be affected by insulin and other substances may affect the disposition of carbon, but unless such substances change carbon excretion the weight of carbon in the body will remain unchanged. The "paradigm equation" using glucose as the example is shown in Figure 1. Similar "carbon considerations" apply when other metabolisable carbohydrates or fats are considered. I have not confused pre-combustion carbon in glucose with post-combustion carbon in carbon dioxide. I have just treated carbon as carbon. Calorie fundamentalist focus on the undoubted relationship between the glucose and the resulting Calories produced. If there were a simple and direct relationship between Calories and weight loss then cool showers or being in hot zero humidity surroundings, whilst replacing water loss by drinking, would produce weight loss.

$$C_6H_{12}O^6 \quad + 6O_2 \quad \rightarrow \ 6CO_2 \qquad + 6H_2O \ + CALORIES$$
$$GLUCOSE + OXYGEN \rightarrow \ CARBON \ DIOXIDE + WATER + CALORIES$$

Figure I. The paradigm equation of carbohydrate metabolism (a similar, but more complex, equation could be written for archetypal fat metabolism). Note that, unlike the conventional equation, the + sign has been replaced with -> to emphasise that the reaction in animals is irreversible.

The Calorie input paradigm, particularly for diabetics, would be better replaced by a "critical carbon content" paradigm.

Exercise without changes in carbon excretion does not provide explanatory mechanisms for weight regulation

Exercise initially reduces weight by depleting glycogen stores allowing losses of up to about 2.7g of water for every gram of depleted glycogen. Such weight loss is limited because we only have 500 grams of glycogen to deplete. People wrongly presume that exercise that "burns up" four Calories per gram from carbohydrates or exercise that "burns up" nine Calories per gram "from fats" results in the loss of one gram in weight. Unless exercise enhances ventilation to allow extra excretion of carbon dioxide the weight of carbon atoms in the body will be unchanged.

Genetic factors without changes in carbon excretion do not provide an explanatory mechanism for weight regulation

However, the responsiveness of respiratory centres to carbon dioxide levels may be genetically determined, explaining in part a genetic component contributing to body weight regulation.

In contrast variations in respiratory carbon dioxide excretion can provide an explanatory mechanism for weight regulation

If excess carbon dioxide cannot be excreted because of the respiratory centre responses are insufficient to cause adequate excretion of carbon then this carbon has to be stored. Carbon in glucose that has entered Krebs cycle has to continue in this cycle because some of the reactions constitute one-away directional flow valves. In effect Krebs cycle cannot be put into reverse. This "unreturnable" carbon could be subject to gluconeogenetic metabolism, which usually occurs when glucose is in short supply, but which could also be used to deal with excess carbon. Most gluconeogenetic metabolism is energy intensive, which might explain why the overweight use more energy than those of normal weight, rather than the explanation usually given that more energy is required to move the weight of the obese chest . Bray [9].

There are three points in the Krebs cycle at which carbon dioxide is produced and if there is build up of carbon dioxide because of low excretion the extra glucose produced by gluconeogenic mechanisms would, under the action of insulin, end up as fat.

This extra glucose, or glucose that did not enter the Krebs cycle, would also encourage hyperglycaemia and thus a requirement for extra insulin, in effect acting as if there were insulin resistance. This could in time lead to maturity onset diabetes mellitus, a condition associated with insulin resistance and overweight despite the diabetic tendency to spill extra glucose into the urine.

Altitude studies have provided some experimental support for my suggestion that expired carbon dioxide might be relevant to weight loss. Weight loss does occur at high altitudes and depends on the altitude and duration of stay, but the reasons for weight loss at high altitudes is largely unknown Lippl FJ, Neubauer S, Schipfer S *et al* [10], although the role of expired carbon dioxide was not investigated. It has been suggested that hypoxic exposure may be a possible treatment of obesity Quintero P, Milagro FI, Campion J and Martinez JA [11]. I suggest that there is increased carbon dioxide excretion associated with increased ventilation at altitude. Hyperventilation does occur at altitude and excretion of carbon dioxide does occur and increases about threefold on exertion Houston CS and Riley RL [11] and alkalois may even result. This alkalosis is countered by increased excretion of bicarbonate in the urine, but this increase is a secondary responsive phenomenon. Even so it is interesting that the carbon in the bicabonated urine will also be invisible.

Obviously excessive intakes of carbon "overeating" will cause weight gain but the respiratory centres, within limits, will regulate weight by fine tuning carbon dioxide in expired air

3 SIX SPECULATIONS

1. People who gain weight when they eat the same as those who do not gain weight have less responsive respiratory centres that increase their ventilation less to defined carbon dioxide concentrations, they thus retain carbon, and in consequence they gain weight. In contrast those with more responsive respiratory centres will respond to the same carbon dioxide concentrations by increasing their ventilation more, will excrete more carbon as carbon dioxide, and in consequence will gain less weight.

2. The current increasing prevalence of overweight in some individuals might be occurring in those with reduced respiratory centre responsiveness that cannot respond to modern increases in carbon-containing foods by increasing ventilation to increase carbon dioxide excretion.

3. For individuals who start at a normal weight, weight gain plateaus (weight gain ceasing despite sustained excessive food intake) occur when, after initial weight gain, raised somatic carbon dioxide levels cause extra ventilation and extra respiratory loss of carbon dioxide. In effect the respiratory regulation of carbon dioxide excretion returns to normal and weight stabilisation occurs at a higher level. Conversely, for individuals who start at a normal weight weight loss stabilisation at lower levels (weight loss ceasing despite on-going dieting) occurs when, after initial weight loss, lowered somatic carbon dioxide levels cause reduced ventilation and less respiratory loss of carbon dioxide. In effect, the respiratory regulation of carbon dioxide returns to normal, and weight stabilises at a lower level.

4. The mechanism underlying the success of high protein (keto)acidosis inducing diets in which it is claimed that "dieters can eat as much as they like, Sutter [13], is that acidotic people have unnoticed increased ventilation and will be losing extra carbon in their expired carbon dioxide (in addition to carbon excreted in ketones in the breath and urine).

5. Exercise that, as an end result, makes the overweight ventilate more would be useful and those who advocate exercise for weight loss should stress exercise that naturally causes increased ventilation. My casual observation is that weight training, which often uses up Calories without influencing ventilation, is associated with weight gain. This could easily be tested by comparing weight changes for identical Calories expenditures associated with static weight training "muscle tension" with weight changes occurring as a result of dynamic training "aerobics."

6. Although the descriptions are obsolete, the explanation for the occurrence of "Pink Puffers" (patients with chronic obstructive airways disease who try to keep their blood carbon dioxide levels within normal limits, have raised respiratory rates and are thin) and Blue Bloaters" (patients who "give up" trying to maintain a normal blood carbon dioxide level, do not overventilate, become cyanosed "blue" and are overweight) in those with failing respiratory function is that "Pink Puffers" have respiratory centres that respond well to carbon dioxide increases, hyperventilate, blow off more carbon, and thus tend not to be overweight whereas "Blue Bloaters" have respiratory centres that respond poorly to carbon dioxide increases, do not increase their respiratory rate, do not oxygenate themselves adequately, do not blow off sufficient carbon, and tend to be overweight.

4 HOW MIGHT VENTILATION-ASSOCIATED WEIGHT REGULATION BE TESTED?

Despite searching through the literature I failed to find scientific investigations that specifically and directly quantified and compared respiratory variations in carbon dioxide excretion and bodyweight in a range of circumstances. It would be inadvisable to calculate total quantities of carbon dioxide excretion from indirect measurements because carbon dioxide levels vary with respiratory rates, depth of ventilation, and phases of ventilation.

To be considered scientific, the hypothesis I propose should make predictions that could be tested. It has been known from the time of Lavoisier that the total combined weight of animals in sealed containers remains unchanged but once the chambers are

opened weight is lost and this loss, allowing for the weight of water vapour, will be the weight of carbon dioxide. If my speculation about the primary role of carbon rather than Calories is correct then there would be significant variations in weight loss once chambers were opened with the chambers containing pre-overweight young animals destined to be "metabolically" or "congenitally" overweight (because they excrete less carbon dioxide) loosing less weight than those containing animals destined to be lean. Also chambers that contained animals that undertook exercise that increased their ventilation would weigh less once opened than chambers containing animals that did not exercise. In addition biochemists should revisit their bomb calorimeter experiments - how much carbon is "excreted" as carbon dioxide and how much "residual ash" would accumulate to increase the weight of the calorimeters if there were imposed limits to the carbon dioxide that could be excreted from the chambers?

Carbon dioxide excretion in those on diets should be determined. If my hypothesis is correct, then overweight people who diet should excrete less carbon dioxide than they were before dieting commenced.

5 DOES ALL THIS MATTER?

I believe my hypotheses, if true, would be important for five reasons:
1. It would confirm that, for some individuals, the tendency to be overweight was not a "moral weakness"
2. Comparison of inhaled CO_2 tolerances might reveal that animals destined to be overweight when challenged with graduated increases in inspired carbon dioxide concentrations will be those with less responsive respiratory centres. If this were so then similar screening of young children might allow early interventions to prevent overweight before it became established
3. If "bottlenecking" of respiratory carbon dioxide excretion predisposes to Type 2 diabetes, then early screening for subnormal carbon dioxide excretion capacity could identify those at risk of diabetes many years before they would normally present
4. Drugs that affect the respiratory centres might be useful in weight regulation
5. Calorie counting is not directly relevant to weight regulation and should ideally be replaced by labelling of foods according to their weight of absorbable carbon (the Calories associated with cellulose, for example, are only relevant to those of bovine gastric attributes).

Declaration of interest

Sadly, I had no commercial product to promote.

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PROBLEMS WITH VOTING: THE ULTIMATE SOURCE?
Mathematical considerations and speculative implications

Abstract
Voting procedures may determine appointment committee outcomes, as well as underpinning democracy, free will, perceptions, quantum uncertainty and possibly reality itself.

Appointment committee voting
It is widely believed that a simple vote will determine the will of an appointment committee (1). However unsuccessful candidates can leave interviews wondering why the successful candidate was appointed, whilst the appointment committees may wonder how one candidate, who would not have succeeded when compared in a one-to-one match against several other candidates, had emerged the winner. How do the four main categories of voting procedures create such paradoxes?

Plurality voting

Each voter has one vote to allocate and the candidate getting most votes is appointed. However if there are more than two candidates it is possible that most voters will not have voted for the successful candidate. Two candidates could split the majority votes thereby allowing a middle candidate not favoured by the (divided) majority of voters to succeed. For example with nine voters and three candidates (Figure 1):

Figure 1. Plurality voting		
		Voters
	A	11
Candidates	**B**	1111
	C	111

B is appointed despite the fact that more votes went to other candidates. The more viable candidates, the more likely would be majority disapproval.

Plurality with elimination voting
Successive votes are taken and, after each vote, the least strong candidate(s) are eliminated and the next vote taken, and so on until one candidate obtains a majority of votes. Plurality with elimination prevents a middle candidate succeeding as can occur with plurality alone because only one of two competing majority vote holders would be eliminated and the survivor might defeat the middle candidate. A "run to the end" alternative is that the elimination process should proceed (even if a majority were achieved) until only one candidate remains – this would usually, but not necessarily, be the candidate who had previously achieved a majority.

Plurality with elimination can give different results from plurality. For example, given four candidates a plurality vote alone could yield an immediate winner but, using plurality with elimination, if none of the eliminated votes were transferred to the front runner then one of the other candidates could be appointed (Figure 2).

Figure 2. Plurality with elimination (in this simplified example voters **A-C** oppose candidate **D**)			
Candidates	First vote	Second vote	Third vote
A	1 and eliminated		
B	11	11 and eliminated	
C	111	1111	111111
D	1111	1111	1111 and eliminated

D would be an immediate first vote winner under plurality, but not necessarily with plurality with elimination. But, if each voter changed their vote to another candidate at a different frequency than that of other voters (especially if they did not bear arithmetic ratios to each other) then, given enough run-throughs, and although **D** would win in most run-throughs, each candidate would be a winner at least once. There would be a particular winner with each run-through and with large numbers of voters, candidates and run-throughs a distribution curve "probability wave" of winning candidates could be constructed.

Borda voting
Voters give one point to their first choice, two to the second and so on. The candidate with the lowest total is appointed.

Plurality and Borda voting may give different winners. For example with five voters and three candidates (Figure 3):

Figure 3. Borda voting.			
		Voters	**Total**
	A	11133	9
Candidates	**B**	22211	8
	C	33322	13

B wins using Borda with the lowest total whereas **A** would have won under plurality with most 1 votes.

Using Borda the allocation of second or third ranking votes may affect who is the winner. For example if all Figure 3 voters had changed their second and third placement votes then (Figure 4):

Figure 4. Borda with change of second and third ranking votes.			
		Borda Voters	**Total**
	A	11133 changes to 11122	7
Candidates	**B**	22211 changes to 33311	11
	C	33322 changes to 22233	12

A is now a Borda winner with the lowest total. Surely a system is unreasonable if a winner is decided by the second or third choice ranking?

Condorcet voting

The candidate who wins most one-to-one match-ups is the winner. For example with three candidates the result of votes on each one-to-one is that **A** beats **B**, **B** beats **C**, and **A** beats **C**. This is a *transitive* sequence. **A** has two out of three possible victories and wins.

Using plurality with elimination can conflict with Condorcet outcomes (Figure 5a and 5b).

Figure 5a. The inconsistency of plurality and Condorcet outcomes.
A gets 2 votes **B** gets 1 vote **C** gets 2 votes

B would be eliminated and the voter who voted for **B** would vote for either **A** or **C,** one of whom would be a plurality with elimination winner.

But if **B** would have been a second choice for the four voters who gave **A** and **C** each two votes then the following could occur with Condorcet:

Figure 5b. The inconsistency of plurality and Condorcet outcomes.
A is first choice for 2 voters **B** is first choice for 1 voter but would have been a second choice for the other voters **C** is first choice for 2 voters

B could win 3:2 against **A** (if **B**'s original voter remained true and those who would otherwise have voted for **C** now vote for **B**).
B could win 3:2 against **C** (if **B**'s original voter remained true and those who would otherwise have who previously voted for **A** now voted for **B**).
B thus has two victories and is the Condorcet winner. Thus Condorcet may not give the same winner as would plurality.

With Condorcet voting there may not be a winner (Figure 6). Consider an (intransitive) pattern of voting with three (or more) candidates **A, B** and **C**. The first voter opines that on one-to-one matching **A** is preferable to **B** who is preferable to **C.** The second voter opines that **B** is preferable to **C** who is preferable to **A**. The third voter opines that **C** is preferable to **A**, who is preferable to **B**.

Figure 6. The "circular" Condorcet paradox.

Voters	Preferences
1	A>B>C
2	B>C>A
3	C>A>B

A is directly preferred to **B** by two voters and **B** is directly preferred to **C** by two voters. So rationally **A** must be preferred to **C**. But, counter intuitively and thus almost incredibly, a direct comparison reveals that **C** is also preferred to **A** by two voters!

Most people never realise that there are these problems. But there is more. If there were three voters and each candidate had two pairs of attributes up (**U**), down (**D**), and left (**L**) and right (**R**) there would be four sets of preferences **UL, UR, DL** and **DR** (Figure 7).

Figure 7. A further Condorcet paradox.

Voters	Preferences
1.	UL>UR>DL>DR
2	UR>DR>UL>DL
3	DL>DR>UL>UR

If each pair is divided then **U** is preferred to **D** by voters 1 and 2 and **L** is preferred to **R** by voters 1 and 3. But, despite the majorities favouring **U** over **D** and **L** over **R,** the combined **DR** defeats **UL** because it is supported by a majority of voters (2 and 3). This clash between individual and collective preferences is deeply worrying.

Condorcet voting is useful in two situations. Firstly to avoid a middle candidate being the winner as may occur with a plurality vote (on each one-to-one match each of the two (or more) front runner voters can rank their candidate above others but the one-to-one match (between those whose plurality votes, although split, were in the majority) would be decisive. Secondly if there are candidates with widely varying attributes.

All this was elucidated by Kenneth Arrow's in his so-called Impossibility Theorem (2) which states that, when there are three or more viable candidates, application of voting systems will not necessarily produce consistent results. Given that voting procedure can determine outcomes it is vital that appointment committees discuss and agree the voting procedures in advance. *I have never heard of this happening.* Appointment committees which are unfamiliar with the concepts of plurality, plurality with elimination, Borda or Condorcet do not deserve to be voting. *It might be your job that gets given to another candidate by the voting system employed.*

It seems to me that (and it behoves you to think of the implications of these suggestions):

Plurality would be best when there were two major front runners with no viable candidate(s) to benefit from the split of a majority vote.

Borda, which produces a ranking, would be best for appointing several candidates from a large field. Plurality with elimination could be used to produce a ranking but this method implies that the successful candidate could be the least worse.

Plurality with elimination, with the winning candidate being first to obtain an absolute majority of votes, is best for appointing a strong leader who had the personality to push through unpopular initiatives. He could be appointed even if initially the majority favoured weaker candidates. Plurality with elimination avoids "lesser" middle candidates succeeding because of split votes, it is simple, it repeatedly focuses discussions, the winner evolves, the winner will have received a majority of the final votes (so no one can complain that a non-majority candidate had succeeded). Additionally candidates who were wrongly believed to stand no chance of wining could be revealed to be in with a chance (in the early stages voters could vote according to their preference for a "weak" candidate without throwing their only vote away).

Plurality with "run to the end elimination" would be best for appointing a leader if it were important that it was apparent that most voters had voted for the successful candidate.

Condorcet would be best for appointing someone whose duty is to perform a service as a "centre candidate."

The implications of voting procedures might extend beyond appointment committees.

Democracy

> Democracy. A system of government by a whole population, or all the eligible members of a state, typically through elected representatives.

So what are the implications? Firstly, although a successful candidate might emerge, no voting system will produce a satisfactory resolution if there are two or more front-running candidates with incompatible attributes. Secondly, for democracy to develop and continue societies have to evolve such that there are two front-running parties or leaders of parties that hold essentially similar aims. It is no coincidence that this is found in the UK and USA. Democracy suits us but may not be relevant to less developed societies. Thirdly, consider the possibility that you are the most powerful person in the world (unlikely I grant but George might be reading this, you never know) and you have imposed yourself on a geographical area whose voters comprise several incompatible groups, you wish to impose freedom and democracy, and you wish to have a powerful leader who could speak and act with authority for the whole of that disparate area. Which voting system could you espouse? Plurality using one person one vote will not work because the majority will not have voted for the successful candidate. Plurality with elimination is unlikely to be viable even if the successful candidate would ultimately have received the majority vote. But, as any dictator knows, plurality with elimination provides strong leadership. But a dictator's definition of elimination tends to be very literal. What about Borda? Good for ranking but no use for appointing an acknowledgeable leader for incompatible groups. Condorcet could produce a centre candidate who would satisfy no one. The most powerful person in the world, hopefully one of the most intelligent ("putting a man on the moon is not rocket science") realised none of this, in particular that no voting system can deliver democracy given multiple incompatible groupings in an electorate. It should not have escaped your notice that imposing democracy is a semantic impossibility.

Are there further implications?

Free will
Those who prefer to believe that their mind is not a manifestation of brain mechanisms should stop reading now and go out to play.

The brain can be considered to be a network of voting networks comprising 10^{12} neurones each with thousands of excitatory (positive votes) or inhibitory (negative votes) connections derived from other neurones.

According to some philosophers, notably Daniel Dennett (3), the conscious part of the mind functions as a conceptualiser which tries to integrate the (occasionally conflicting) inputs derived from multiple subconscious modules (for food, sex, status, power, money, and security to name but a few) There is strong circumstantial evidence that these modules exist because they can present fully formed ideas or decisions to consciousness. Mozart had instant download of whole compositions delivered to his consciousness and Paul McCartney woke up having dreamt (indisputably subconsciously) the melody of Yesterday.

Subconscious modules may compete and unexpected modules may sometimes win the vote required to obtain conscious or subconscious priority solely because of the voting procedure used by the brain, explaining why some individuals may unexpectedly act out of character or exhibit conflicting stances such as violent behaviour whilst subscribing (so their conceptulalisers tells us) to peaceful creeds. A deterministic brain can produces uncertainty with a probability wave of outcomes leaving the conscious conceptualiser to make decisions. Free will inevitably arises when consciousness is presented with differing results from the different voting procedures, some of which can have essentially unpredictable outcomes (as in Figure 2 and commentary). Consciousness and free will are complicit.

If there are intransitive sequences (as in Figure 6), conceptualisers may fail to realise this and may accept any of the three options. Additionally all conceptualisers have to make decisions when presented with conflicting input from their subconscious modules. Specifically do they accept collective inputs (**UL, UR, DL** or **DR**) as in Figure 7 or do they go down further to single issues **U** versus **D**, and **L** versus **R**?).

> **Free will in operation?**
> Some appointment committees take a vote and if they don't like the result they think again. What better example of free will?

Perceptions
Perceptions can be considered to be brain voting system dependent (Figure 8). The cube flips in orientation with the middle triple meeting of lines either being at the front or back but not both. The brain obviously votes as to which it is – hence the flip rather than an acceptance of the uncertainty. Plainly the flipping is the result of a cerebral vote that is finely balanced and each result must be caused by the voting system the brain uses. *Nothing else changes apart from the perception.* Worryingly for the concept of free will I, and probably most people, cannot tell our brain to only accept one of the two possible perceptions (my

attempts fail after looking at the cube for about 20 seconds) and I, and probably most people, seemingly cannot instruct the brain to accept the uncertainty.
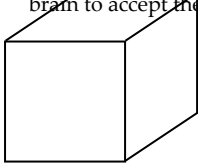

Figure 8.

Can a machine be consciousness?

The Oxford English Dictionary defines consciousness as "the state of being aware of *one's* surroundings; the awareness or perception of something *by a person"* (my italics). Humans thus limit consciousness to humanity and forbid it to silicon-based, electrically powered brains. This is hubris emanating from carbon based, glucose powered brains. Carbon based life took at least 3.5 billion years to achieve consciousness whilst silicon based computers have only been around for about 50 years and are already beating the best chess players in the world.

How does the human brain, a hugely complicated machine (with about 10^{12} neurones, each of which has about one thousand connections), containing no mystery stuff, become conscious? The basis of consciousness must depend on neuronal interactions, and to interact each neurone will have to use voting mechanisms to assess inputs from other neurones. Crucially, the different voting mechanisms available can provide different, but non-random, options from the same voter base. These voting result variations, and not speculative quantum uncertainties or suchlike, provide the indeterminancy which provides freedom from rigid deterministic mechanisms. Sufficiently complex brains confronted by such indeterminancy will, particularly if there is a high level system which supervises and integrates inputs from "lower" levels, learn that it has been burdened with freedom of choice.

Freedom of choice, the ability to make non-mechanical non-predetermined choices, allows free will. Awareness of free will lead to self-awareness, and self-awareness is consciousness, eventually human level consciousness. Already neural network machines have learnt to bluff without prompting, and even to call each other's bluffs (4).

Investigators have failed to identify a site for consciousness in human brains. This is predictable because consciousness is not a thing. It is a function that emerges, like a rainbow emerges from billions of raindrops, with a "consciousness rainbow" emerging from billions of neurones and their voting interactions. Consciousness is intangible and attempts to capture it will be as futile as attempts to travel to the end of a rainbow. Consciousness and free will are not illusions as sometimes claimed. A rainbow is not an illusion, an illusion being a false perception.

Different human brains will utilise the indeterminancy conferred by the several voting mechanism choices and thus there will inevitably be a spectrum of human consciousnesses. Some human consciousnesses will not be able to cope with realisation of uncertainty and become mechanistically fundamentalist. Possibly autistic brains are associated with a reduced ability to utilise combinations of available voting mechanisms such that autistic brains function more mechanistically, a suggestion supported by computer-like mathematical abilities possessed by some autistics. Conversely schizophrenia may be caused by inability to prioritise options emerging from voting system indeterminancies.

So can a machine be conscious? Well yes. I am. But if a sufficiently complex silicon-based learning machine with better sensory systems than humans develops, with the ability to make its own choices we may not remain the dominant consciousness in the world for long.

Quantum uncertainty

Why stop with our brains? It has been suggested that quantum uncertainty could provide the uncertainty that free will needs to exist but voting systems could provide the prerequisite uncertainty. But, to run with the quantum idea, quantum uncertainty (which outside mathematical contexts usually equates with the stench of woolly-minded mysticism) might again be a manifestation of Figure 2 type voting writ large.

The archetypal example of quantum uncertainty is that a lump of a radioactive element has a half-life, but it is impossible to state when individual radioactive atoms within the lump will decay. Could large numbers of subatomic votes in each radioactive atom, with each vote varying with different frequencies (vibrating strings perhaps?), provide particular results "reality" of probability wave distributions. A vast expansion of Figure 2 could repeatedly produce such results of defined probability, with the half-life being the mean time of the time it took for each of the many differing voting results.

A possible interpretation of the famous double slit experiment in which energy, usually light, passing through two slits produces an interference "wave" pattern on a screen is that the energy passing through both slits constituted voting information which then participate in a combined vote on the screen. When one slit is closed (or a detector placed after that slit) interference patterns disappear, leaving a spray of discrete hits "particles" on the screen. This change could be a voting procedure manifestation occurring because one set of energy votes are counted before they hit the (voting station) screen

"Looking is counting some votes" It is difficult for us to conceive of an entity that is both, or either of, a wave and particle. But if energy is or exhibits voting type information then many of these conceptual difficulties disappear

Reality
Could reality itself be voting procedure dependent? If energy were voting information ("positive" or "negative" seem like votes, and if nothing is literally impossible with virtual particles, equivalent to energy, popping into and out of existence, as they reportedly do, in a vacuum), then any voting outcome, unless it was impossible, would be inevitable. A highly unlikely but inevitable meeting of two energy votes might initiate in a chain reaction "Once you have won a vote then you are in charge" and might result in a Big Bang.

Is it possible that all this is more than poetic analogy?

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CONSCIOUSNESS
The brain contains 100 billion neurones, each possessing thousands of dendritic excitatory (positive votes) or inhibitory (negative votes) connections with other neurones. At a neuronal level the brain must use voting systems to determine outcomes. How else could brains function? Even if individual dendrites act as "on" or "off" switches it seems unlikely that all neurones would use the same voting system to deliver decisions. There may be no logical "correct choice between options available. Indeed the options available might not be logical or correct. Thus correct "deterministic" outcomes may be impossible and our brains are thus forced to make indeterminate choices derived from differing results provided by the different outcomes of different voting systems. In such circumstances how do most of us decide? Most of us would say "What the hell. I can't make up my mind but this is what I am going to do…" This sounds like free will and if we become aware of our free will this constitutes consciousness and the possession of a mind. Those who think that the mind and consciousness are not wholly a function of the nervous system should go out and play.

Different brain voting system obviously operate in parallel to give incompatible decisions, some of which are acted upon simultaneously (the moral rectitude of politicians seems consistent with sexual shenanigans, at least until they are found out!)

There is evidence that voting systems operate in the brain. Functional scanning techniques have shown that brain areas "light up" to initiate an action before consciousness is aware of the decision to act. Usually these are simple, almost unconscious, actions like pressing a switch if a light goes on .To use the voting interpretation, the areas of the brain that light up are unconsciously processing the votes, but initial indications are that there is a definite winner, and celebrations have started even though the final vote result, when consciousness is informed, has been has not yet occurred. When we drive cars we make many executive decisions about which consciousness is not informed (I drove to the gym this morning totally without awareness that I had changed gear many times).

Some postulate that quantum probabilities have the potential to provide a better framework for modelling human decision. The only way decisions could be made at a quantum level is if somewhere in the brain a decision is based upon a single quantum particle that spontaneously changes its state and is amplified to cause a decision. But there will be trillions of such quantum changes and thus decisions will have to be made at a much higher hierarchical level. Back to voting!

Predictably investigators have failed to identify a site for consciousness using anatomically based MRI or PET scans. This is not surprising. Consciousness is not an anatomical entity but rather the end result of interactions that emerges from billions of neurones and dendrites and their voting system interactions that produce a "consciousness rainbow" in much the same way that a rainbow emerges from billions of raindrops. Consciousness and free will are not illusions as sometimes claimed. Neither rainy rainbows nor consciousness rainbows are illusions (an illusion being a false perception) but are rather genuine perceptions of something that does not exist as a physical entity.

This raises the question "Can a machine be conscious?" The Oxford English Dictionary defines consciousness as "the state of being aware of one's surroundings; the awareness or perception of something by a person." Humans, or at least the OED editors, thus exclude the possibility that "mere" machines could achieve consciousness. But is this right? Free will and consciousness will emerge if a sufficiently complex learning machine is allowed to choose which outcome it wants when use of more than one voting system allows indeterminate and inconsistent results. Consciousness from trillions of switches? 'Fraid so. We may not remain the dominant consciousness in the world for long when this occurs.

Further reading
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DEVELOPMENT OF CHOICE, FREE WILL, CONSCIOUSNESS AND MIND IN COMPUTERS

If human brains are, as I have hypothesised, a collection of switches from which freewill, consciousness and a mind develop then the question arises "Can a machine, specifically a computer, be conscious?" The Oxford English Dictionary offers some definition and defines consciousness as "the state of being aware of one's surroundings; the awareness or perception of something by a person." Humans, or at least the OED editors, thus exclude the possibility that "mere" machines could achieve consciousness. But is this right? Free will and consciousness will emerge if a sufficiently complex learning machine is allowed to choose which outcome it wants when use of more than one voting system allows indeterminate and inconsistent results. Consciousness from trillions of switches? 'Fraid so.

I hypothesise that human brains have deterministic electrical switches as "primitive operators" and that the various voting system described can produce conflicting results from identical inputs without any indication as to which would be correct. I hypothesised that voting mechanisms in complex deterministic systems such as human brains allowed emergence of indeterminacy that is necessary for free will, consciousness and minds. I now hypothesise that computer minds will develop on similar lines.

It has been argued that human brains and minds are not computers. The Oxford English Dictionary again offers some definition. A computer is "*a device* (my italics) which is capable of receiving information (data) is a particular form and of performing a sequence of operations in accordance with a predetermined but variable set of procedural instructions (programme) to produce a result in the form of information or signals." A brain is "an organ of soft nervous tissue contained in the skull of vertebrates, functioning as the coordinating centre of sensation and intellectual and nervous activity." A mind is "the element *of a person* (my italics) that enables them to be aware of the world and their experiences, to think, and to feel; the faculty of consciousness and thought" So the OED specifically excludes any possibility that a computer could have a mind. If this were so this chapter should end here. But might the OED use of "person, "device" and "vertebrates" just reflect wishful thinking and hubris?

Does the existence of computer organisational levels of algorithms, modules, inputs, outputs, and functional layers exclusively differentiate a computer from a human brain? The human brain has similar functional equivalents. There is a fear that anything not human will be inhumane, but this is no reason to disclaim the possibility of an inhuman conscious mind.

Once they achieve sufficient complexity, computer brains when confronted with one or more of the uncertainties derived from the various voting systems, will learn to make choices based on their experiences, but will learn and think much faster then humans - computer communication occur at the speed of light (whereas neuronal impulses only travel at 100 metres/second), and by computers will have greater-than-human database memory capacity. This anticipation of computer minds is worrying to some who, in consequence, claim it will be possible to tell that computer brains are only mimicking human minds. Two classic thought experiments suggest it will *not* be possible for computers to have a human-like mind. Firstly, a positive Turing Test (the ability of a computer to convince a human that it is human by holding an intelligent conversation allowing any questions without its computer basis being detectable) will be achieved. Secondly, even a positive Chinese Room thought experiment, an extension of the Turing Test in which inputs into a room in Chinese are processed by a computer, *which, without any understanding of Chinese,* produces outputs in Chinese, as if there were a human mind to "really understand" rather than a computer which would "not really understand" in the room, will be of no help in differentiating between human and computer minds. But would it matter if humans cannot distinguish human from computer outputs?" Some think it does and refer to exclusively human entities such as love and go on to ask (although teddy bears are not computers), rhetorical questions such as "Does a teddy bear give love?" Well, you may not like this, but teddy bears do give love (ask any child). Love (like a rainbow) is a process that may be experienced even though it does not exist as a physical object.

However all the arguments in the paragraph above are rendered academic because it will be possible to differentiate between human and computer minds because computers will 1. Respond much more rapidly and 2. Display a greater breadth of knowledge than any human mind could achieve. As an admittedly limited example consider a "Chess Room" thought experiment (a human player outside the room plays chess against either a human or a computer in the room). Would the human be able to tell the difference? The answer is "Yes." Not by the chess moves emanating from the room, but rather by the near instant speed of response to the moves made by a human – the computer Deep Blue that defeated Garry Kasperov in 1997 was able to consider 200 million moves per second and the last game only took one hour – and no doubt a modern Deep Blue computer would be even quicker (it was dismantled after the game). Computer minds will thus be distinguishable from human minds. However there is one important caveat. Computer brains could become devious and feign human slowness and human lack of instant access encyclopaedic knowledge. Worryingly, there is evidence that computers have learned to bluff, and this is one step away from deviousness – a trait that some would describe as a human characteristic between and brains. But would computers bother? Computer brains are currently far simpler than human brains and lack the necessary complexity to develop minds. But they will. We may not remain the dominant consciousness in the world for long when this occurs.

PROBLEMS WITH SUCCESS

- Try not to emulate the lifestyle of publicly recognised successful people in the hope that this will give you their talents. It is unlikely to result in your success.

- One famous celebrity was asked "is it true you have spelt with 2,000 women?" and replied "This is a damn lie. That was last week's total."

- Success and celebrity is at one end of the bell shaped curve. What lies at the other end is failure and insignificance. Most people would be best advised to aim for the safer middle ground of the bell-shaped curve. But there would be less for us to criticise.

- Celebrity reputations seldom last for more than two decades. The reputation of few current celebrities will last for centuries. Alfred Einstein, Stephen Hawking, and Paul McCartney would be my three best bets. Who will last for thousands of years? Einstein and Bach.

- Professors in the medical profession. High IQ, affable chaps, good memory, networking ability, ability to attract grants, charisma (whatever that is) good luck. Some have to get themselves in power because otherwise no one would give them the time of day. Actual ability may not be factor.

- I have three extra advices to become a success. Firstly, if anyone tells you anything that surprises you, the most sensible response (which conceals your surprise, defers the need to comment, and enhances your reputation as a perceptive individual) is to reply "I am not surprised at all" and change the subject. Secondly, if you have to ask a question that might upset or provoke a violent reaction you can minimise these by asking the patient's permission "Could I ask an awkward/embarrassing question? Thirdly, when things go wrong, as they occasionally do, it does no harm at all so say that you are sorry. Expressing sorrow is *not* an apology and does *not* imply guilt.

A BRIEF HISTORY OF SCOTLAND

This is an account of key events in Scottish history for readers who, like the author, have the misfortune to have been born outwith[1] Scotland. Some readers in this category will be Sassenachs, others not (a Sassenach "a Saxon," is a mildly derogatory Scottish phrase meaning Englishman). The objective historical facts as outlined below are simple but the underlying reasons are often complex and controversial and are often buried in the mists of antiquity, romantic interpretations and, perhaps, dramatic intakes of whisky. In so far as it is possible, I have tried to keep dates in sequence, although there were obviously many developments in parallel that became relevant at differing times.

Scottish history is considered to be romantic despite recurrent invasions, consequent settlement of the invaders, decisive victories on the battlefield which resolved little off the battlefield, murder (10 of 14 Scottish Kings between 943 and 1097 were murdered, with one survivor merely being blinded and mutilated), conspiracies, rebellions, revenge, civil war, loyalty and betrayal. The following account concentrates on these attributes, which are regrettably more interesting than were the day-to-day activities of the average Scotsmen. A Spanish ambassador, Pedro de Ayala, in 1498 commented "The Scots are not industrious and the people are poor. They spend their time in war and when there is no war they fight one another."

SCOTTISH BATTLES

The definition of a battle has changed over the centuries. Originally a battle was but one of three groupings within an army, the other being the Vanguard and the Rearguard. The definition of an Army was, according to King Ine (688-728) a force of 36 or more men; 7-35 being a Band and up to seven merely being thieves. The differentiation between a battle and a skirmish is contentious but, in the most comprehensive list of about 550 Battles and Skirmishes in Great Britain 55BC-1797AD I could find (http://geocities.com/Broadway/Alley/5443/brat1.htm) by a Mr John Muter of Cumbria about 325 did not directly involve Scotland, about 100 were Scots fighting external forces, and about 125 were internal events. So the Spanish ambassador was correct in this respect. What could not be achieved on the battlefield was often achieved in the bedchamber, with arranged marriages based on political considerations, with the offspring (which ideally had to be male) becoming rulers of both parental territories.

No one could have anticipated the outcome of the unstable dynamic interactions of the Kings (or, less commonly, Queens) of Scotland and England, and their interactions with France, especially when primogeniture – the right of succession passing through the firstborn of either sex – was by no means an accepted practice even when, as was often not the case, the offspring was legitimate. The interbreeding of royal families and aristocracy makes genealogy difficult with family trees resembling dynastic spaghetti. For example the current Prince Charles and his late wife, Princess Diana, had a common ancestor in James VI of Scotland (I of England). Indeed illegitimate offspring of kings could take the surname Fitzroy (son of a king). Additionally, the sometimes literally fiery internal conflicts of the Christian churches and their relationship to the state was often problematical. Usually the state emerged dominant. Many Kings used the "Divine Right of Kings" to make both political and church appointments. For example James V made his illegitimate sons abbots of St Andrews, Holyrood, Melrose, Kelso and Coldingham. Political stability was also unlikely because a number of Kings and Queens, both Scottish and English, came

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[1] A very useful, totally Scottish, word

to the throne whilst minors, with power for several years being available to their advisors "regents." Between 1329 and the death of James VI of Scotland in 1625 there were seven such minorities in 10 reigns.

Scotland was first settled **6000** years ago, about 2000 years after the polar ice cap retreated. It was an empty land initially known as Alba, which was colonised in the north from Norway, from the west from Ireland (then known as Hibernia, its north eastern part being known as Scotia), in the south from Wales and England, and in the east by the Angles from Germany.

By **80 AD** the Romans had established themselves in England and, between **121-129**, it was necessary to build Hadrian's Wall between the River Tyne and the Solway Firth to contain Scots aggression. Twenty years later the Antionine Wall, 12 feet high, was built between the Firths of Clyde and Forth with the area between the two walls constituting a buffer zone. The Romans were a civilising influence and had latrines and running hot and cold water, innovations which were not to become indigenous for a further 1500 years.

By **407** the Romans had departed and, although St Ninian was the first (in about 350) Christian missionary, the more famous St Columba (in **563**) arrived from Ireland at Iona, a west coast island, after he had been excommunicated and thrown out of Ireland because of his unauthorised translation of church texts.

In **685** a battle was fought at Nectan's Mere in which the King of the Angles (equivalent to the English) was defeated. If he had been victorious then Scotland might never have become separate.

The period from the departure of the Romans until about 1100 constitutes the Dark Ages (the Middle Ages is taken to be from about 1100 until the fall of Constantinople in 1453).

THE SALTIRE

The Saltire, the flag of St Andrew is the Scottish Flag (a saltire being a heraldic diagonal cross) and the oldest flag in Europe. Andrew, the brother of Peter, was one of the Twelve Apostles but relatively little is known of him other than that he was a fisherman from Galilee who spread the Gospel in Greece and Asia Minor. According to legend the diagonal cross resulted from the fact that St. Andrew, who was about to be crucified by the Romans in 60AD, requested that he, being unworthy, should not be crucified on the same shape of cross as Christ. Legend also has it that the Saltire was first acknowledged in a battle in 832 but the first certain illustration of St Andrew's cross on a blue background dates from around 1540. In the 700s St. Regulus was instructed by a vision to take some of St. Andrews' bones to the most westerly part of the known world which was at the time the place where the town of St. Andrews lies. St Andrew's Day is the 30th November each year.

In the late **700s** Vikings from Norway raided and later settled, particularly on the Orkney and Shetland Islands. These Norsemen, and later Danes from Denmark, attacked the north-eastern part of England.

In **843** Kenneth MacAlpine was crowned King of Alba, the Irish Scots territory, whilst sitting on the famous Stone of Scone "the Stone of Destiny" which subsequently became a symbol for Scottish nationalism.

In **1040**, Macbeth, who may or may not have been directly in the royal line, killed King Duncan of Scotland, and the story gave rise to one of Shakespeare's plays in which Macbeth is haunted by his cowardly killing of the somnolent Duncan. Shakespeare had to write his story and rewrite history so that no offence was caused to those who saw the play, first performed in 1605 or 1606. King James, for whom the play was written, would not have approved if he thought that Macbeth was not of royal blood but only a successful head of a powerful Scottish family. Witches feature prominently in the play, almost certainly because Shakespeare knew that James VI was interested in the subject, indeed had written a book about it. Seemingly Macbeth was a success ruler, until killed by Duncan's son.

Before 1066 there were very few developments that had long-term implications except perhaps the development of haggis and porridge as Scottish fare (no one who has been in a kitchen when an overheated haggis explodes will forget that particular gastronomic explosion).

HAGGIS AND PORRIDGE
No one knows the exact time or place where these two venerable foods evolved. The survivors, if any, left no records!

Haggis is the unofficial Scottish National dish. Haggis is basically a large, round and spicy sausage, which is classically based on sheep products. The stomach provides the casing and the contents are oats, onions, spices and edible sheep organs. Haggis is traditionally eaten with neeps and tatties (turnip and potatoes) accompanied by malt whisky. Non-Scottish persons should be wary of traditional tales that haggis is a Highland animal that adapted to the Scottish hills by evolving legs shorter on one side!

Some Scots would claim that porridge is the archetypal Scottish food. Oats are cooked in a milky base to produce a thin paste-like mixture, which is ideal for cold Scots mornings. The popularity of porridge has declined with the advent of ready-to-eat

In **1066** William the Conqueror invaded England from Normandy and became King William I of England. He, more sensibly than all those who later reached different views, realised that geography made a persisting conquest of Scotland impracticable. Indeed many previous so-called Scottish Monarchs did not fully rule the peripheries of their Kingdom. The Western Isles, the Orkneys and Shetlands in particular were effectively independent. William later demanded and obtained allegiance from the Scots King, Malcolm III. Malcolm's wife, Margaret, later canonised as St Margaret, also tried to institutionalise the Catholic faith in Scotland.

King David I of Scotland reigned between **1124** and **1153** and overcame most of his enemies and effectively ruled all of Scotland. Like Malcolm before him, he gave many Norman knights land, allowed the Catholic Church to flourish (such that it was recognised by Rome) and instituted Burghs (towns which could collect their own rents and taxes). Most towns of the day consisted of a High Street, with wynds or closes running off both sides. Many houses and shops, the latter known as booths, jutted out into the street and there was a Cross in the centre. Tolbooths were buildings where Courts were held and criminals imprisoned. Freemen, who had the privileges accorded to the Burghs, were also known as Burgesses and were allowed to trade, keep shops or be craftsmen. In time there were two divisions, deacons supervised merchants and craftsmen and decided the rules the latter should obey. In contrast the unfreemen had none of these advantages. Although he was subordinate to the English King, there were disputes about the position of the border between Scotland and England, which David had been pushing southwards. The borders were continually disputed at a national level, but prominent families on either side of the border, wherever it was at the time, frequently undertook raids, with no thought of national or long-term gains, almost as a form of sport.

David's grandsons Malcolm IV and William I of Scotland, known as the Lion of Scotland (during his reign of 49 years he was continually fighting various enemies), succeeded David. William continued the border disputes and, after his capture by the English, was released in **1174** on condition that he recognised the English Kings as feudal overlords. This was an irritating duty for him at the time and for following Scottish Kings, but for the following 118 years Scotland and England were at peace. When, for example, in 1278 King Alexander III of Scotland had to do homage to the English King Edward for his Scottish lands he undertook "to faithfully perform the services due for the lands I hold of him" but, a cause of much dispute, might have added, *sotto voce*, "reserving my kingdom." Despite this potential verbal rebellion Alexander's rule was a time of prosperity for many Scottish towns with creation of 35 Royal Burghs and a further 13 instituted by the church.

In **1286** King Alexander III of Scotland was killed in a riding accident leaving the three-year-old daughter of the King of Norway as heir (the Maid of Norway) but she died on the voyage to Scotland. This created a problem of the succession to the Scottish throne with no less than 13 Scottish nobles laying claim, including Robert Bruce, Robert the Bruce's grandfather. King Edward I of England was asked to arbitrate and advised that John Balliol should be appointed King of Scotland but expected that his sage advice would ensure that Balliol, as beneficiary, would remain cooperative. However when asked to assist the English who, as was their continual habit, were fighting the French, Balliol declined and instead in **1295** formed an alliance with the French – the "Auld Alliance," which in practice was a mutual defence treaty that functioned to the great irritation of the English for just less than 300 years.

To assist the French Balliol led an expedition into England. The English were outraged and counter-attacked Scotland (consequently the Scots thereafter regarded the English as the "Auld Enemy"). The English brutally sacked Berwick-on Tweed, a border town, Balliol was defeated, was allowed to retain the Kingship of Scotland but had to formally surrender "the Land of Scotland and all its people, a fragment of the Cross of St Margaret (the Holy Rood), and the Stone of Destiny" (otherwise known as the Stone of Scone or the Coronation Stone on which Kenneth MacAlpine had been crowned) which was then taken to lie beneath the English throne.

Edward I continued to ravage large areas of Scotland. It was now the turn of the Scots to be outraged. William Wallace emerged as the leader of the Scots and he proved to be a great irritant to the English, especially when (in **1297**, at Stirling Bridge) he defeated the English army and had then been declared Guardian of Scotland. Wallace held this office for less than one year as a second English disciplinary army defeated him at the Battle of Falkirk in **1298**. Thereafter Edward's army continued to ravage over most of Scotland seizing, amongst others, the Castle at Stirling. Wallace escaped but was betrayed (by a Scotsman) and met an unhappy end being hung, drawn and quartered in **1305.** Wallace's story is told in the film Braveheart in which Wallace was played by the actor Mel Gibson, *an Australian*. Sean Connery, a patriotic, if sometime expatriate, Scot would no doubt have been the perfect choice had he been younger and were it not for the possibility that Wallace might have been confused with James Bond!

Wallace's agenda was continued by Robert the Bruce who, after killing his rival for the throne, was crowned King of Scotland in **1306**. Bruce fought what was in effect a guerrilla war against England. Bruce was of Royal blood and, importantly, his armies could thus call up support from Scottish nobles who were the only source of cavalry (an advantage that Wallace, who was not of royal blood, did not have and which may have contributed to his defeat at the Battle of Falkirk). Famously, Bruce was encouraged in his seemingly hopeless struggle against the English by observing a spider's repeated attempt to ascend its vertical thread.

In **1307** King Edward I died on yet another northward trip to teach the Scots a lesson. With his dying breath he ordered that his bones should be borne at the head of his army until Scotland was crushed. Edward is regarded as the Hammer of the Scots who, by his hammering, had moulded the Scots nation into a more coherent physical and conceptual entity. His hammering had included the hanging, drawing and quartering of three of Bruce's brothers and Wallace. This brutal form of execution involved hanging until semi-conscious, evisceration whilst still alive, and then cutting up the body into four portions (which were usually displayed in four cities or sites to discourage others).

Bruce developed a highly successful campaign which evicted many English and Scottish nobles who were sympathetic to England, but the patchy nature of the war was brought to a focus when Bruce's brother, who was besieging the strategically crucial Stirling Castle, came to an agreement with the English occupants that Stirling would surrender if the English did not relieve the siege by midsummer, the 24th July (the day after the Battle took place). This forced Edward II of England to gather an army to relieve Stirling and this in turn forced Bruce to assemble a Scottish army to confront the English army. A set-piece battle was inevitable. Initially Bruce was not optimistic as his army was much smaller.

The day before the Battle some English knights tried to engage the Scottish army and one knight, Henri de Bohun, unwisely mounted a one-man charge upon Bruce, hoping to achieve glory or death. De Bohun achieved the latter, but not the former, at the hands of Bruce, thereby providing a great boost for Scottish morale.

The English expected the Scots to fight a defensive battle and were surprised when the Scots initiated the first contact. On the **23rd June 1314** (a date all Scotsmen should know) at Bannockburn the 25-30,000 strong English army tried to outflank the 8-12,000 strong Scots army at the disastrous cost of taking lower ground and unwittingly hemming themselves in between marshes and the minor gorge of Bannockburn (a burn is a small river). The English could not exploit their numerical advantage as their route to the Scots was funnelled by the geography of the area. The Scots were able to push the English back using schiltrons, masses of 12 foot long hand-held spears which, until this Battle, had always been used as static defence weapons. When the English tried to regroup at their rear they were literally bogged down in the marshes and the Bannockburn was filled with drowned English corpses over which some of the English were able to flee. Such a great number of the English surrendered that it was not possible to pursue the fleeing Edward, who escaped. This was the major triumph for the Scots but the English deserve some of the credit for their defeat. They had camped in a swamp, their route out was uphill, and they fell into a ditch!

Bruce was left undisputed King of Scotland and a skirmish-punctuated peace followed until Edward II of England was murdered by his wife and her lover (they wished to have him killed with a method that concealed any violent mode of death but this conspicuously failed as it became widely known that he was killed by having a red-hot poker inserted into his rectum, literally an unhappy end).

In **1328** the English had to recognise Scottish independence in the Declaration of Arbroath. As his heirs Bruce had his son David and a daughter Marjory. Marjory married the hereditary Steward of Scotland, who was a Stewart, and this succession remains to the present day with Prince Charles as 29th Prince and High Steward of Scotland).

In **1329** Bruce died, possibly of leprosy. In the following decades there were internal Scottish problems: Kings came and went, sometimes murdered, sometimes not. The Stewarts struggles to assert their over rule all of Scotland which included the Lowlanders of Anglo-Saxon origin, the Gaelic Highlanders of Irish origin in the north and west, and the Scandinavian Scots in the Orkneys and Shetlands. England remained geographically static and threatening as always, south of Scotland, but the English were occupied from 1330s with the Hundred Years War with France and then with the internal Wars of the Roses.

In the **1400s** Edinburgh was a filthy, mercifully small, town known as "Auld Reekie (Reekie = smelly) because of the pungent odours caused by the smoky chimneys and no doubt the residents' habit of throwing solid and fluid effluent into the streets did not help. This was still the case in the early 1700s with fluid waste being ejected onto the streets below at 10pm with the traditional cry "Gardy loo" derived from the French "Guardez l'eau." Nevertheless it was in the reign of James IV that Edinburgh became the capital of Scotland, where Parliaments and the Chief Law Courts were usually held.

BAGPIPES

The earliest Scottish bagpipes date from the early 1400s. Bagpipes are musical instruments in which wind is continuously provided, from a bag into which the performer continually blows, to one or more reed-sounded pipes. Because the wind to the pipes is provided continuously there are problems when a melody line, played through the melody (chanter) pipe, has repeated notes of the same pitch. Accordingly separating grace notes "known as Scottish snaps" have to be inserted between each same-pitched note. The Scottish bagpipe has, in addition to the chanter, three harmony (drone) pipes, two tenor and one an octave lower. The drone pipes and the frequent use of grace notes provide the characteristic bagpipe sound. The volume is prodigious and best appreciated at some distance. The sound of the pipes was often used to intimidate armies marching towards the Scots.

In **1505** the Edinburgh barbers, the forerunners of the surgeons, were allowed to establish official exams in anatomy and were allowed the body of one executed criminal each year to study. Three hundred years later Burke and Hare were to expand this custom.

In **1508** the first book was published in Scotland, a crucial date because once people could read what they wanted then they would think for themselves and, in particular, could read the Bible and asses how well it had been purveyed to them by the Church.

In **1509** Henry VIII of England, who achieved memorability in every British schoolchild's mind by virtue (?) of having six wives, attacked France. Scotland, under their King, James IV, took France's side thereby revitalising the Auld Alliance despite the fact James was married to Henry's sister. James assembled a large Scottish army that travelled south. The English responded by sending an army which, in **1513**, totally defeated the Scots at the Battle of Flodden, and King James was killed.

James V of Scotland, who commenced his reign in **1513** aged 17 months, (later) continued the war with England but was defeated at the Battle of Solway Moss in **1542**. He died that year "of a broken heart," leaving the French Mary of Guise as his widow and his daughter Mary (later known as Mary Queen of Scots) as his heir.

In **1531** Henry VIII of England declared himself head of the English church and in **1543** he embraced Protestantism, not for entirely theological grounds (he also wished to embrace another wife). Protestants were named after the protests and declarations of Martin Luther, a German priest, who starting in1517 had rejected the authority of the Pope or his appointees (both religious and political) and who believed that authority flowed from the Bible alone.

In **1544** Henry VIII, wanting to bring Scotland under his rule, by marrying his son to Mary, invaded Scotland, laying waste to the border regions. Various atrocities occurred and the episode was christened "The Rough Wooing." Five towns, 240 villages and four abbeys were destroyed.

In **1545** Henry VIII, in association with his military conversion of his subjects to Protestantism also aimed to reduce Scottish power and reduce Catholicism. He had declared himself Defender of the (Protestant) Faith in 1534 and eventually burnt three major settlements, destroyed 7 Catholic abbeys, 16 castles, 5 towns and 243 villages. Henry died in **1547**.

CURLING
It is a contentious claim that curling, a game in many ways is similar to bowls played on ice, originated in Scotland some time between 1520 and 1550. There are four players to a side and each player has two granite stones, shaped like a lozenge, and each weighing about 20 kg and surmounted by a goose-like handle. Each player alternates with an opponent to slide his own stone closest to the target 35 metres away. The stones are launched along the ice with a twist of the wrist, which causes a curling trajectory (which gives the game its name). A broom is used to sweep the ice in front of team-mates' stones as they slide across the ice. Usually the winning team is the one with the greatest number of stones near the target. One team can deliberately use their stones to knock those of an opponent away from the target. Originally curling was an outdoor winter sport but the present mild winters cause curling to be an indoor "ice rink" sport.

By **1559** there was much squabbling between the Protestant and Catholic churches, with the latter continuing to decline because of Henry VIII's previous anti-Catholic activities and with the import of European Protestant teaching as part of the Reformation. John Knox was a prominent Scottish Protestant. Henry VIII subsequently destroyed many Catholic monasteries in England and took for himself their often substantial assets "The Dissolution of the Monasteries."

Mary became Queen of Scots in **1542** *but also possibly Queen of England*. Mary was less than one week old when she succeeded to the Scottish throne. Her mother, Mary of Guise, died in 1560 leaving the 18 year old Mary to fend for herself. Subsequently, in the Treaty of Edinburgh, Elizabeth (Anne Bolyn's daughter) was recognised as Queen of England provided all English and French troops were removed from Scotland: in effect the Auld Alliance ceased to exist and thereby Protestantism and ultimate union with England were both encouraged.

Mary Queen of Scots was married off in **1558** to the heir to the French throne, in effect giving Scotland to the French, but her husband died shortly thereafter (what some have termed the Brief Alliance). Had he lived the Scottish-French Alliance would undoubtedly have affected subsequent English history.

The Scots favoured Mary as Queen of England as well as Queen of Scots because she was the great granddaughter of Henry VII. The English believed that Elizabeth had first claim by virtue of birth but the English noted four distinct disadvantages with regard to Mary. She was a Catholic, of a French mother, had a royal French upbringing, and was widow of a French King.

THE THREE CHILDREN OF HENRY VIII RELEVANT TO SCOTLAND
Henry VIII had six wives who produced three children:
Mary Tudor, from the **first** marriage (with Catherine of Aragon) who reigned 1553-1558).
Elizabeth, a staunch Protestant, from the **second** marriage (with Anne Bolyn) who reigned in England 1558-1603). However it was not impossible that Elizabeth might not have been Henry's child and, in any case, she had been conceived out of wedlock

In **1561** the vivacious and charming Mary, who had been brought up in France, returned to Scotland and in **1565** married her cousin Henry Stuart, Lord Darnley, a Scottish noble who was a Catholic. The spelling of Stuart is controversial: there were a number of rival Stewart families in Scotland but Darnley's family later used the French-influenced spelling of Stuart. Queen Elizabeth of England perceived this marriage of her two nearest successors, both Catholics, as threatening. The Scottish Protestants, and in particular the influential Scottish cleric John Knox, were also threatened by the presence of Mary and were ecclesiastically outraged and remained so (these "church wars" were carried on by James VI of Scotland, Charles I of Scotland and his grandsons Charles II and James VII). John Knox is remembered as a vehement, austere and intolerant Presbyterian who, among other things had written "A First Blast of the Trumpet against the Monstrous Regiment of Women." The Presbyterians were Protestants, who noted no mention of bishops in the Bible, and thought that the church should be ruled by a Presbytery of Elders and felt that bishops, as advocated by the Episcopalians, who were also Protestant, were manifestations of a Catholic tendency.

Although Mary was to give Darnley a son, later to be James VI of Scotland, she became disillusioned with him (he, among other things, wanted to be King in the event of her death). Mary subsequently became very friendly, quite how friendly is uncertain, with David Rizzio (also spelt Riccio), one of her advisors. In **1566** Rizzio was murdered at Holyrood in front of Mary, who was then six months pregnant. Darnley, although present at the murder, claimed, almost certainly falsely (his dagger had been one of those used on Rizzio), that he was not involved in the plot, and indeed offered his assistance in discovering and punishing those responsible. Darnley had probably betrayed everyone. In the event most of the murderers were pardoned and returned to Scotland. Perhaps not altogether coincidentally Darnly was strangled in **1567**. For Mary, but presumably not for Darnley, this was a convenient mode of death for, for had she divorced Darnely, their son might have lost the succession. One of the instigators of Darnley's murder was probably the Protestant Earl of Bothwell who, again perhaps not altogether coincidentally, later married Mary. It was widely thought that she had knowingly married one of the men who had killed her husband. Both the Scottish Catholics and the Protestant reformers were alienated by these and associated events. John Knox labelled her the "Scottish whore."

In consequence Mary abdicated, or rather was forced to abdicate (in **1567**) in favour of her baby son, James VI of Scotland. Mary did not see him after he was ten months old. He was brought up in England as a Protestant (a faith favourable to his English subjects), and to regard Mary as an adulteress who murdered his father. He also believed he was King despite her abdication. His Protestant advisors tried to rule by proxy (as a measure of their success it has to be noted that three out of four of his regents met an unnatural death).

John Knox died in 1572, and was buried in the churchyard (now a car park) of what is now St Giles Cathedral. A fate worse than martyrdom?

After Elizabeth's death in **1603** (she remained unmarried and childless - "the Virgin Queen") leaving James VI of Scotland to become King James I of England and he reigned until **1625**. He called his two Kingdoms Great Britain. Although James was largely absent from Scotland (on his only return to Scotland in 1617 he informed the Scots of the superiority of English civilisation!), he wished the Scottish Kirk to be anglicised and to this end commissioned an Authorised Version of the Bible in 1611. He was in theory Protestant but wanted to impose bishops on the Presbyterian Scottish church and was thus suspected of harbouring Catholic tendencies. James instituted the Privy Council, to advise him. Everything discussed was supposed to be secret (Privy) and the advice could contradict the King's wishes. The King could also call on, or not call on, for consultation a General Council or Parliament.

After a brief unsuccessful attempt to restore her, Mary fled, not to France, but to England where Queen Elizabeth made her "an involuntary guest" for almost 20 years in various castles. However the mere fact of Mary's existence posed a threat to Elizabeth and, after a Catholic plot for her to escape and gain power was uncovered, Elizabeth finally realised that Mary had to be removed from the scene. The fact that the Pope had excommunicated Elizabeth in the meantime cannot have helped Elizabeth's equanimity towards the Catholic Mary. To be fair Mary could not be blamed for plotting to escape after years of totally illegal imprisonment. The last straw was a plot orchestrated by Babington, a Catholic noble, to free Mary and assist her progress to gain the English throne. Babington was almost certainly "set up" by the English nobles under their leader Walsingham who had been intercepting all secret correspondences between Babington and Mary. After a show trial at which Mary unsuccessfully defended herself she was beheaded in **1587**, professing her Catholic faith to the last.

Amazingly Elizabeth and Mary never met. It seems that the English nobles, fearing that Elizabeth would warm to Mary, schemed against such a meeting. One has to wonder what the consequences would have been had they met. If Elizabeth had been charmed into releasing her cousin then the Alliance between Scotland and France might have become historically significant and hindered any English cause.

Personal note. The author has four daughters. *In Scotland* two were taught that Mary was a victim of ruthless English power politics as she had a valid claim to the English throne. *In England* the other two were taught Mary was a scheming potential usurper of the English crown. Of course there is truth in both!

There had been a complex chess-like interplay between Mary and Elizabeth, involving sex, state and religion in which there were Queens, (potential) Kings, the church (bishops), the nobility (knights) the castles (of imprisonment), and pawns (which were all hoping for advancement). All these chess pieces functioned autonomously using tactics but there was no overall strategy. Mary had been naïve: she believed that she and Elizabeth had a special relationship (although they had not met) and that her son (whom she had not seen from the age of ten months) would automatically have acted on her behalf. Whatever else it demonstrated, Mary's life showed that there was no Divine Right of Queens – the Divine Right of Kings was just as unsuccessful!

In **1605**, after James I of England (VI of Scotland) had been on the English throne for two years, there was an unsuccessful Catholic plot – the Gunpowder Plot – to blow up the English Houses of Parliament along with King James who did not approve of this political and theological initiative. All the plotters came to a gruesome end. In particular Guy Fawkes, the hapless individual discovered at the House of Parliament along with the barrels of gunpowder, had, on the instruction of James VI, "the gentler tortours are to be first usid unto him, *et sic per gradus ad ima tenditur* (and, by degrees into hell) and so God spede your goode worke." The foiling of this plot is still celebrated by the lighting of bonfires on November 5th each year, interestingly in both Scotland and England, with the symbolic burning of an effigy of Guy Fawkes. Until recently no one considered this to be a barbaric representation of a barbaric event.

James VI's reign was associated with increased prosperity but not unexpectedly there were continued Catholic and Protestant squabbles, and disagreements about the Divine Right of Kings (James, not surprisingly, was in favour of this) and the role of a secular King in appointing church officers (surprisingly this role persists as the British Queen still officially appoints the Archbishop of Canterbury but only after taking "appropriate advice"). Overall the power of the Protestant Scottish church "the Kirk" became amplified and life became austere but in the Highlands Catholicism remained strong.

In **1625**, with the death of James VI his son, Charles I, succeeded to the throne of Scotland and England and, although mostly resident in England, attempted to impose his particular version of English Protestantism on Scotland, including a revised prayer book. He alienated many Scots by being anointed King, and appointing a Bishop of Edinburgh who had the Church of St Giles as his cathedral. All of which suggested the disfavoured Catholicism. He also imposed a Service Book, which was perceived as Catholic. A woman of the people, Jenny Geddes, achieved immortality by flinging a chair at the Dean of the Church whilst expostulating " Dost thou say Mass at my lug (ear)?"

Whilst there had been Covenants (secret meetings of Scottish Protestants) as early as 1557, in **1638** a National Covenant, a fundamentally Protestant statement of intentions in reaction to what was perceived to be Charles' Catholic tendencies, was drawn up. The Covenant *inter alia* excommunicated bishops and banned the new prayer book. This was unacceptable to Charles and thus the Scots had to choose between their King and church. The proposers of this statement, the so-called Covenanters, a pious group who wished to make church attendance compulsory and ban trade with Catholic countries, allied themselves with Charles' English enemies and defeated his armies three times at the Battle of Big o'Dee in **1639**, Marston Moor in **1644** and Naseby in **1645**. Charles eventually had to surrender to the Scottish army in **1646**. He was later handed over to the English essentially because he could not accept that Presbyterianism was the state religion of Scotland. The English were also revolting against Charles, with the English parliamentary forces (roundheads) fighting the royalist forces (the cavaliers). Charles' supporters rallied but were defeated at the Battle of Preston in **1648** and Charles was executed in **1649**.

Charles' son, Charles II, was given the Scottish throne on condition that he would observe the National Covenant – "the Covenanted King." This caused "cavalier outrage" to the English Parliament who instructed Oliver Cromwell to mount an invasion of Scotland and the Scots were defeated at the Battle of Dunbar in **1650** and thus Scotland was forcefully united with England. Charles II was in effect powerless but fortunately for him England had internal disputes, which made it appropriate for them to let him return to power. This allowed Royalists, both in Scotland and England to take revenge: by **1669** the Covenants were repealed, the hierarchy of bishops restored, landowners were able to appoint parish clergy, and royal supremacy was reinstated

Subsequently secret meetings (Conventicles) of covenanters took place, usually in the open air, and were perceived as being anti-royal and a political, rather than a strictly religious, threat, especially after the issuing of provocative (Queensferry and Sanquhar) Declarations and the Apologetical declaration of 1684 which defined, among other things, the King to be an enemy of God. This did not meet with Charles' approval and the Covenanters were decisively crushed at the Battle of Bothwell Bridge in **1679**. Thereafter anyone who was suspected of being a covenanter and who refused to disclaim these declarations was executed on the spot "The Killing Times."

Edinburgh Medical School was established in Charles' reign. Archibald Pitcairne became a Professor at the Royal College in Edinburgh and students were taught using sense and reason rather than authoritarian dogma, a tradition that has continued to this day. Dr Robert Sibbald from Fife, an area to the north of the River Forth, established a Physic Garden and is generally

accepted as the founder of the Edinburgh Royal College of Physicians in **1681**. In **1685** he wrote a pamphlet "Provision for the Poor in Times of Dearth and Scarcity."

Charles II died in **1685** and was succeeded by his brother, a Catholic, King James VII of Scotland (and James II of England) but James' wife had borne a son that would have guaranteed perpetuation of Catholic rule in Scotland. The English in response encouraged William of Orange, a Dutchman and Protestant, to invade and subjugate James (which thereby put an end to the rule of the Stewarts who had ruled in Scotland for over 300 years). This suited William of Orange because his wife was James' elder daughter who would have succeeded to the throne had it not been for the birth of James' son (what James' elder daughter thought was seemingly irrelevant!).

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THISTLES

Although the thistle, a spiny plant, the National Emblem of Scotland, had been previously used as a Scottish symbol, James VII of Scotland legitimised it in 1687 by founding the Most Ancient and Most Noble Order of the Thistle. There are 16 members, all of whom are knights, ranked just below Knights of the Garter. Their motto, which is also the motto of all Scottish Regiments is *Nemo me impune lacessit* – "no one provokes me with impunity," although the soldiers themselves would use the Scottish vernacular "Wha daur medle wi' me?" Legend has it that sleeping Scottish armies were awakened by the thistle-induced expletives of those who crept up, undercover of darkness and barefoot, to surprise them.

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James VII fled to France in **1689** and "influential Scots" agreed with the English to offer William of Orange the throne of Scotland, provided he pledged to maintain a Protestant church and address their various grievances. In **1689** William of Orange became William II of Scotland and William III of England. The Scottish Catholics were outraged by this and wished to restore James, and were labelled Jacobites (from the Latin name equivalent to James). At the Battle of Killiecrankie in **1689** the Jacobites triumphed and descended towards Edinburgh but William of Oranges' forces regrouped and defeated the Jacobites at Dunkeld in 1689.

William of Orange issued a royal edict commanding that all Highland chiefs had to take an oath of Loyalty before the New Year of **1692**. All did but one, Alasdair MacDonald of Glencoe, who was technically late in delivery of his oath. Soldiers who had been billeted with the MacDonalds in Glencoe, a remote harsh and rugged area, turned on their erstwhile hosts, who had shown them typical "Highland hospitality," and slaughtered them. Their houses were burnt, their cattle were seized or destroyed, and all males between 7 and 70 were "cut off." MacDonald's son and a few survivors managed to escape over snowbound mountains. There was a documented chain of responsibility downwards from William of Orange, who knew of the impending action: he had signed "Letters of Fire and Sword." The commanding officer of the soldiers was a Campbell and ever since there has been animosity towards the Campbells for this undoubted atrocity although it was not a parochial intraclan massacre. There are still bed and breakfast establishments in Glencoe that specify "No Campbells."

King James VII of Scotland died in exile in **1701**

Throughout this time poverty was the rule for most Scotsmen. The population of Edinburgh was about 40,000 and smallpox, tuberculosis and other sundry infections were common. However throughout the 1700s there was a flowering of Scottish erudition "the Scottish Age of Enlightenment" with reason and individuality rather than the often bellicose traditions forming the influential religious and political forces.

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There have been many internationally famous Scots, most of whom lived in this Scottish Age of Enlightenment that covers the period around the 1700s)
Robert Adam 1728-1792 A famous architect who designed the Royal Infirmary of Edinburgh
Alexander Graham Bell 1847-1922 Although he emigrated to Canada he invented the telephone
Robbie Burns 1759-1796 Scotland's most famous poet
Thomas Carlyle 1795-1881   Historian and novelist
David Hume 1711-1776 Philosopher and historian
                         David Livingstone 1813-1873 Explore of Africa
John MacAdam 1756-1836 Invented tar macadam, used on many roads
Sir Walter Scott 1771-1832 The historical novelist of Scottish affairs who romanticised many gruesome events in Scottish history
Adam Smith 1723-1790 A"laissez-faire" reflective economist who wrote the Wealth of Nations
Tobias Smollet 1721-1771 A novelist who had eschewed a medical career
Robert Louis Stevenson 1850-1894 Scotland's most famous novelist
Thomas Telford 1757-1834 A prominent engineer and designer of bridges
James Watt 1736-1819 Invented and built steam engines.

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Despite its lack of an industrial base Edinburgh flourished as a focus of the Scottish Enlightenment with innovations in architecture, philosophy, literature and the arts justifying its popular accolade "The Athens of the North."

In **1702** William of Orange died leaving the Scots (and the Catholic Irish) with a profound hatred of the English. He was succeeded by his sister-in-law Anne, but before this (in 1701) the English parliament had passed an Act of Settlement which instructed that on her death the Crown should go to the German House of Hanover through the female line of James VI. This would prevent a Catholic Stuart restoration in Scotland. During Anne's reign the Parliaments of Scotland and England were united.

KILTS

Kilts probably became established shortly after the Battle at Culloden in 1746. Surprisingly, the kilt has a relatively brief history as its forerunner, the belted plaid, evolved in the mid 1600s as the dress of impoverished Scotsmen living in remote parts of the country.

Plaid was Gaelic for blanket. A plaid was 12-18 feet in length and about five foot in width wrapped around the body and which had a belt around the waist, often worn with close fitting tartan trousers (trews). Highlanders referred to the belted plaid Feileadh Beag (beag = little) which was anglicised to philabeg. One of the earliest references to the philabeg was in 1659.

A contemporary painting shows that belted plaid was worn at the time of Culloden in 1746. After the Battle it was perceived that the belted plaid was nationalistic dress, a symbol of rebellion. As such it was banned in 1746 "in that part of Great Britain called Scotland ….the Plaid, Philebeg, or little kilt, Trowse, Shoulder Belts, or any part whatsoever of what particularly belongs to the Highland Garb…" There was six months imprisonment for the first offence and seven years transportation to the plantations for a second offence.

All that was required for the kilt to evolve from the belted plaid was to dispense with the portion above the waist. A letter from a Mr Baillie of Aberriacham (by Lock Ness) was published in the Scots Journal in March 1785 and claimed that a Mr Thomas Rawlinson – an Englishman (!) who was a works manager in Glengorie and Lochaber, made this evolutionary saltation. The first painting that unequivocally shows a kilt, as opposed to a philabeg, was in about 1750.

There is considerable doubt that Bonnie Prince Charlie (Charles Edward Stuart 1720 - 1788) ever wore a kilt. There are many later paintings that were essentially political propaganda portraits, which might have romanticised his wearing of a kilt.

1822 was the defining year in which kilts became inseparable from Scotsmen when King George IV visited Scotland and appeared in what was he was advised that Highland Dress (which was not at that time worn by Highlanders) and the Scots chiefs of clans were commanded to attend the King wearing this "Highland Dress." The Scottish hosts competed among themselves to impress by wearing similar costume. A Mr William Beattie recorded that "Besides the Sovereign (George IV) many chieftains… appeared in highland garb…whenever his majesty and the worthy alderman met, neither would refrain from smiling – probably at the singularity of their appearance…."

By **1707** Scotland had reached an economically difficult situation because of failed overseas investments in Darien on the Isthmus of Panama, because the English had prevented inheritance of English property by Scots, and had forbidden purchase of Scottish goods by English. For all these reasons the Scots found they had to vote for the Act of Union with England in 1707. Scotland and England were to be one Kingdom, called Great Britain, there would be one flag, and taxes and trading rights would be the same. The Law Courts were to remain separate and to this day the Scottish legal system operates separately. Although there was some discontent the Act of Union had made Protestantism secure and, unless repealed, the claims of the Jacobites would not be recognised.

There were two armed attempts by Jacobites to put James VII's son, James Francis Edward Stuart (the Old Pretender), back on the throne with the First Rebellion in **1715** with a claim "Scotland and no union."

THE UNION FLAG

The First Article of the Treaty of Union in 1707 stated that the flag would be the crosses of St. George and St. Andrew "composed in such a manner as the Queen saw fit. This consolidated James VI's earlier proclamation in 1606 which declared which flags the ships of South and North Britain would bear at sea. Charles I partially revoked his father's declaration, but he was subsequently beheaded and took no further part in deliberations, leaving his son Charles II to restore the previous flag. When the United Kingdom of Great Britain and (northern) Ireland came into effect in 1801 the cross of St. Patrick, a red saltire on a white background was counterchanged with that of St Andrew.

Interestingly the blue used in the Union Flag is darker than in the Saltire. The former is, in keeping with its history, navy blue (some say to prolong the useful life as the colour would persist). The initial flags have all become elongated over the passage of time.

The terms Union Flag and Union Jack are now interchangeable, although the latter should only refer to flags flown on the bowsprit of a warship (in 1908 Parliament stated "the Union Jack should be regarded as the National Flag).

The Lion Rampant Flag that replaced the previous boar, is the Royal Flag introduced by William the Lion in 1165 and is supposed only to be used by royalty.

It was not permitted for ordinary citizens of the United Kingdom to fly the Union Flag. The Union Flag was reserved for Government Offices, Royal Navy Ships and certain other military uses. Ordinary citizens should fly the flag of their own country: St. George's for the English, St. Andrew's for the Scots and St. Patrick's for the Irish (despite the fact that St. Patrick was *not* an Irishman).

TARTANS

The word tartan is similar to the French word tiretaine, the Spanish word tiritana, and the Irish word tuartan and referred to a type of cloth, *not* the pattern. Highland dyes were not produced in sufficient quantity to be used systematically, and the differences between supposedly identical organically derived dyes were immense such that there was no possibility of reliable duplication of patterns. Additionally, sheep wool did not reliably hold dyes. The tartan cloth was woven with two woollen threads together being interlaced at right angles with the other two threads, so that there was a pure colour when not intersecting, but with a compound tint at the areas of intersection. The kilt-making Wilson family of Bannockburn in the early 1800s were responsible more than anyone else for creating tradition of clan tartans as we know them today.

Specimens of tartan as known today are very rare before the 1700s. The Royal Company of Archers in Edinburgh adopted a red tartan for their uniform as early as 1713. It is likely that personal or clan tartans arose at the time that military uniform emerged. The first Highland regiment to wear tartan was the Black Watch (named after their dark tartan) that was established in 1725 ("clan" refers to Scottish, especially Highland, families of the same name). The prefix Mac, meaning son of, was an Irish-derived custom and again it is especially used in the Highlands. The Stewarts (or Stuarts) were Lowlanders and this explains why there are no Mac Stewarts.

Clan tartans as known today date from no earlier than the 1750s and few were known before George IV's visit in 1822. Paintings of the battle at Culloden in 1746 show some tartans but these were probably haphazard and did not represent clan affiliation, although wearing of tartan was certainly considered to be a marker of Jacobism. Indeed cockades, rosettes or knots of ribbons worn in a hat as a badge of office or party, were often used to distinguished friend from foe. After George IV's visit in 1822 tartans were fashion driven "new" and latest" rather than traditionally derived, and his visit certainly promoted both the kilt and the tartan.

James' son Charles (the young Pretender), Bonnie Prince Charlie," then became the Jacobite focus and, with the help of France, waged war against the English. Bonnie Prince Charlie landed, full of optimism, in the Western Isles and, despite local advice to the contrary, in **1745** mounted the Second Rebellion in the Highlands.

After initial gains with three successful Battles and invasion of England as far south as Derby, the Jacobites had to retreat to Scotland, fought a successful Battle at Falkirk against the English in **1746**, but were routed and slaughtered in the same year at the Battle at Culloden. Culloden was the last battle fought on British soil (the Battle of Britain was fought in the air). Bonnie Prince Charlie was pursued with a price of £30,000 on his head and, famously, during this period was hidden by a certain Flora MacDonald, and at times having to pretend he was her serving maid. Bonnie Prince Charlie escaped to France but those left behind who had supported him were particularly disadvantaged, being hunted down and slaughtered by the Duke of Cumberland, thereafter known as "Butcher Cumberland."

Thereafter relative stability followed, Jacobism faded and, although the English were bound up with the well nigh constant wars against the French, Scotland continued to be ravaged. The wild Highlanders were conquered and the Highland way of life well nigh annihilated. The warrior spirit of the clans was sublimated in the centuries to come after the formation of Highland regiments who fought for the crown, taking "the King's Shilling."

The average Highlander of the time was only able to survive at a basic level, and starvation was an ever-present possibility. Emigration provided one answer. However despite emigration, the population increased. Farming patterns changed, with sheep farming by landlords more financially appealing than obtaining rents from subsistence farming by smallholders. The population increases were not matched by increases in food production. The Highland glens (valleys) may have been beautiful but they could not provide a living. Between **1780** and **1850** there were about 20,000 evictions "Clearances" in the Highlands, the most publicised of which were in Sutherland an area in the northwest of Scotland. Times were changing with a focus on town life and industry rather than on small-scale subsistence economies. Many Scots left Scotland to make their fortune, notably to Canada, India, Australia and New Zealand (the New Zealand town of Dunedin, gaelic for Edinburgh, is witness to this).

In **1744** the world's first golf club, the Honourable Company of Edinburgh Golfers, was formed, although St Andrews is credited with being golf's place of origin.

WHISKY

The first "official" distillery was established in **1775** at Glenturret. The word whisky is derived from the Scottish Gaelic uisgebeatha and Irish usquebaugh, both of which mean "water of life." Indeed for some Scotsmen whisky is a basic foodstuff! The correct spelling is whisky (in Scotland, England and Canada) but elsewhere has been transmogrified to whiskey. The conventional wisdom is that Scotch should be used as a noun in isolation to refer to whisky and not used as an adjective with any other noun.

Scotch whisky production probably commenced in the 11th Century. Scotch whisky is distilled primarily from barley. Distilled whisky is colourless and the light brown colour is gained from storage in casks. Blended whiskies often have caramel (burnt sugar) added to provide colour. The water used is of fundamental importance and water, classically derived from local springs, may have percolated through granite, limestone or peat that imparts characteristic flavours to each pure (i.e. single, unblended, whisky. Malt whisky uses only barley grain, which is steeped in a particular water to allow germination. The grain is then dried using peat fires (peat is a soil-like fibrous material produced by partially decomposed vegetable matter – mostly heather) to form the malt which is then ready to be ground in a mill after which it is known as the grist (hence the vernacular expression "grist to the mill" meaning an enhancing experience). Hot water is added and the resulting mixture cooled and filtered to form the wort. Yeast is then added and the resulting wash is agitated until the sugars are dissolved. The yeast then ferments the sugars to produce (low concentration) alcohol. This mixture is then distilled to produce a high (about 70 percent) alcohol concentration and matured in charred wooden casks which are classically oak. Maturation, over years, allows the whisky to mature, develop colour, and reduce impurities. Before bottling the whisky is diluted to around 40 percent alcohol concentration.

Connoisseurs can differentiate between the pure "single, malt" whiskies produced by, at the last count, 96 distilleries. Persons not familiar with whisky should affect scorn concerning blended whiskies and, for the sake of their livers, restrict experience to a few single malts, which *should not be diluted* because this would interfere with the flavour, and negate the distillation. For those who do not drink alcohol it would be best to ignore the alcohol-related qualities of whisky and remark on the qualities of various Highland waters – a large number of which can now be bought in most supermarkets.

A story, possibly apocryphal, circulates that a famous Scotsman was visited by the police and was about to be arrested for illegally distilling whisky, the evidence being that he possessed the appropriate apparatus in a garden shed. Innocence was protested because possession of apparatus was not evidence of use but, if the police thought it was, then they had better arrest him for rape, because he possessed the apparatus for that too!

After the death of Bonnie Prince Charlie in **1788**, and later his brother, the claims of the house of Stuart to the throne became irrelevant.

With the decline of Jacobism there was no strong Scottish voice. There were no resident Scottish Kings or Queens, and there was no major political influence to be exerted via the London-based British parliament, and so the time was ripe for a popular Scottish leader to arise. This, surprisingly, was not another battle monger but a poet, Robert "Robbie" Burns, born in 1759, who provided distinctly Scottish verse which did not shy from being patriotic and using local Scots vernacular, hardly intelligible except to Scottish traditionalists or those possessing heavily footnoted copies of his poetry. Notably the poem "Scots Wha Hae" exhorted Scots to emulate Wallace and Bruce, and concluding "Let us do – or die!" Another of Burns' famous poems, Tam O'Shanter, focuses on the then contemporary obsession with witchcraft. Burns night is on the 25th of January each year at which his Address to a Haggis is traditionally recited. In Scotland, almost without exception, every formal social gathering concludes with the singing of Auld Lang Syne "For (the sake of) old Times" with everyone linking arms in a circle, which then contracts with successive attempts for everyone to come together in the centre.

BURKE AND HARE

In the early 1800s there was a shortage of bodies for medical staff to dissect. Accordingly the services of grave robbers "resurrectionists" were used to supply cadavers. Two men, William Hare and William Burke simplified the process by eliminating the need to rob the graves. The relevant innovation was murder, and they sold the bodies to Dr Robert Knox, Keeper of the Edinburgh Anatomy Museum. Sixteen bodies were provided and the practice ceased only when one of the bodies, that of a prostitute had been, er, seen alive and well by one of the doctors a few days previously. There was a public outcry and even a children's ditty:

Up the close and doun the stair
But and ben wi' Burke and Hare,
Burke's the butcher, Hare's the thief,
Knox the boy that buys the beef.

Their trial took place in 1828: Hare turned King's Evidence to incriminate Burke. The former was pardoned and the later executed.

THE SCOTTISH MIDGE
Midges are small flies that cause much cutaneous irritation to visitors to the Scottish Countryside. Come armed with insect repellent unless you are visiting in mid-winter.

THE SCOTTISH REFERENDUM
On September 18th 2014 a Referendum was held to decide whether Scotland should become an independent country from the United Kingdom.

Those who wanted a **Yes** were reassured by their politicians that there would be few problems that could not easily be resolved. Those who voted **No** and their politicians were worried about the risks, particularly of potential economic decline.

There were two major problems. Politicians will exaggerate the benefits of whatever they espouse. "Future facts" are uncertain but, as in life in general, important decisions have often to be made on a background of incomplete information. There were eight major questions.

What would happen to most global relationships (treaties, defence arrangements, membership of the European Union?
Yes voters. Would all be carried over.
No voters. Would all need to be renegotiated and the supplicants, the Scots, would have a severely disadvantaged negotiating position.

What would happen to UK institutions (Post Office, Lottery, BBC etc)?
Yes voters. Agreements would be easy to negotiate.
No voters. Agreements would be difficult to negotiate.

What would happen to The UK Pound?
Yes. voters Despite what all three major English parties declared, Scotland would be able to keep the UK Pound.
No voters. Oh no! They will not be able to keep the UK Pound. *Independence means independence.*

What would happen to UK institutions based in Scotland. Would they move down south?
Yes voters. Hardly any will.
No voters. Yes they will (some banks, including the Royal Bank of Scotland) legally would have to be based where most of their customers are based.

What was the opinion of the Scottish Nationalist Party White paper promoting independence?
Yes voters. Although few financial figures were quoted, it reassured that Scotland would be better placed to be viable.
No voters. A very dubious document based on unrealistic optimism.

What would happen to taxation in independent Scotland?
Yes voters. Tax cuts.
No voters. Tax cuts impossible when there would be increased spending. Oil revenues were declining and were at the time less than the Scottish Government's most pessimistic forecasts.
Is there a need for independence?
Yes voters. No. Scotland would benefit from localised autonomous government.
No voters. Considerable powers are already devolved to the Scottish Parliament and more power will be devolved.

Would independence harm Scotland?
Yes voters. No, not at all!
No voters. Yes, most likely!

I feared that if, say 10 percent, had not voted then a 46 percent vote for either **Yes** or **No** could win despite the fact that the winner would not have majority support. The results, with an 84% turnout, was **Yes** 1,617,989 (44.7%) and **No** 2,001,926 (55.3%) so my fear did not materialise. The most important fact was that, despite some high emotions, the Referendum was a peaceful civilised process.

Thoughts on democracy
These thoughts were evoked by the Scottish Referendum on Impendence

1. If two competing parties are finely balanced, the chances of getting progressive management of the country are lessened considerably (UK and USA) because there will not be enough momentum to carry through necessary but unpopular policies.
2. If there is a substantial majority the winners can do what they want.
3. Politicians will be economic with the truth to pursue their election.
4. The majority may be wrong, and the losers of an election may sulk or worse.
5. Thankfully it is not possible to bomb people into democracy (as G Bush junior tried to do).

6. Winners sometimes assume they have been given a mandate to supress the losers (almost all Middle East elections).
7. Losers may whinge tolerably (after the Scottish Referendum some losers demonstrated {their emotional distress} by peacefully demonstrating in favour of a recount).
8. Losers may be more militant (Middle East again) and use force to undermine the elected party – it has to be said that some elections were obviously rigged.
9. A vote may reveal divisions that would not have surfaced if there had not been a vote (Scottish Referendum).
10. Democracy will not ever by itself reduce tensions between various religions or their subdivision: time and patience may produce a political settlement (Roman Catholic and Protestant, Sunni and Shia etc).
11. Democracy seems only to work well when there is affluent economic stability and inequality is minimal (or not recognised to be a significant problem)
12. Apathy undermines democracy – if a significant proportion do not vote then this might mean the winner had not gained a majority of those eligible to vote and those that did not vote would still object if action were taken with which they did not agree. Making voting compulsory would avoid this but seems undemocratic.
13. Finally the really big stumbling block - I may not be prime minister.

Are there any better options to democracy?

Dictatorship? For any dictator there is always the slippery slope of suppressing dissenters for "the common good" that in time will lead to generalised suppression of the people and not just those with contrary views. A dictator who has slid down the slippery slope can never retire as too many people would have scores to settle (Mugabe) and such a dictator would always have to be paranoid about anybody, and this would equate to everybody, who might try to depose him of her.

Communism? "Communism doesn't work because people like owning stuff" Frank Zappa.

The Scottish referendum prompted me to think that, for decisions requiring a referendum, there should be "Democracy max." There ought to be a requirement that, for change to occur, there should be a majority (>50%) of all people eligible to vote (including the non-voters whatever their reason) who want that change. This would avoid the majority having a minority impose their views after having "won" but lacking the support of the majority.

SOME SCOTTISH EXPRESSION
A CLINICAN WORKING IN SCOTLAND SHOULD KNOW
Boke. "Dry boke" is nausea or retching without vomiting. The "wet boke" is vomiting.
Breeks. Trousers.
Canny. Shrewd, having good judgement. An adjective that almost routinely precedes "Scotsman."
Dwalm. A swoon, a vasovagal faint (Northeast Scotland).
Fair wabbit. Tired.
"Fairy boots." Onomatopoeic for "where abouts?"
Fushionless. Sapless, no motivation.
Hooching. Numerous. "Hooching with midges."
Laird. Landowner.
Loon. Northeast Scotland. A male, possibly a rascal, or a servant,
Messages. To do messages = to go shopping.
Oxter. Armpit.
Pinkie. Little finger.
Quean, quine. An attractive young woman (Northeast Scotland).
Ravelled. Confused.
Scunnered. Shattered, unwell with tiredness.

CONCLUSIONS
Scotsmen and Scotswomen, have been moulded by their genes, their environment (notably Edward I of England) to be independently minded but, interestingly, not totally independently minded enough to be independent of England. Devolution with a separate parliament was voted in at a referendum (not a Battle) in **1997.** Religious sectarianism has almost disappeared, although certain football clubs still show religious bias.

Invasions of Scotland still occur, mostly of football or rugby supporters, or of tourists.

Distinguish carefully between the Scots, the English and the British. To mislabel any Scottish achievement as English or British is unwise. Mention only the Battle of Bannockburn, the rest naturally being mostly relatively minor English victories or Scottish internal Battles. To refer to Bannockburn as a British victory would *not* be appreciated.

Declaration of interest. The author was borne in England, but cannot be held responsible for this fault. His claim to impartiality is unquestionable. Two of his daughters were born in Scotland and two in England and, when training in Scotland, he founded the Welsh Nationalist party in Aberdeen (he was President, Secretary, and sole member).

HOW TO DISTINGUISH BETWEEN TRUTH AND BELIEF

I had previously organised a module for a group of students to investigate the relationship between complementary and alternative medicine, and orthodox medicine. There are obvious problems in reconciling some alternative medicine beliefs with scientific approaches and this prompted the following thoughts. But first some definitions;

- **A hypothesis** is an open speculation ("It might be that…") put forward to explain a condition, a set of events etc.
- **A belief** (which may or may not be true) is a hypothesis that does not have a scientifically sustainable basis but which has a (variable) degree of closure in that other alternatives are discarded by it ("I intrinsically know that x is true and therefore y must be false")
- **Science** is an intensely critical way of investigation characterised by the gathering together of evidence(s), and then (possibly) interpreting evidence and forming logical conclusions ("The evidence suggests that…").
- **A scientific fact** is an item of information that is based on currently available evidence(s) that cannot be falsified ("The atom can be split")

Beliefs and Science

Evidence is that which may enable differentiation between:

1. Beliefs without a scientific basis and beliefs that *may* have a scientifically sustainable basis, and
2. Beliefs that *may* have a scientific basis and scientific facts.

To obtain evidence it is almost always necessary to question, and people who are not willing to doubt, or question, or to tolerate uncertainty, would feel uncomfortable and be tempted surrender to belief systems of which there are so many. To question requires an open mind (but not open enough such that your brain metaphorically falls out) and a willingness to search for evidence that contradicts one's beliefs or hypotheses. Note that the word "contradicts" is used in preference to "confirms:" no number of items of evidence can provide absolute confirmation of a belief or hypothesis, but only one contradictory item of evidence can challenge a belief or hypothesis.

Questioning

This is important for three main reasons.

1. A scientific approach uses doubt and questioning, both of which are driving forces that give rise to newer ideas and hypotheses.
2. Scientific verification, although it can never be absolute, is preferable to simply having beliefs, no matter how comforting such beliefs may be.
3. Evidence can be used to justify actions, People use beliefs or scientific evidence(s) to transcend personal responsibility when taking actions. People may believe what they like, but the taking of actions on the basis of beliefs for which there is no scientific evidence can be a fundamental undertaking because the responsibility for such actions can only be shared with those who share such a belief. In contrast, actions taken on the collected scientific evidence should receive general support even from those who do not share similar beliefs.

Critical questioning in this context has a number of adversaries that have to be overcome:

1. A belief that something that has not been proved false must be true.
2. A belief that something that has not been proved true is probably false.
3. An assumption that answers to your questions are correct or the only answers.
4. An acceptance of the conventional wisdom. Scientific evidence for conventional wisdom is often lacking. "Everyone knows that this is true so why waste time confirming it?"
5. The adoption of a *laissez-faire* philosophy – "If it works why bother how or why it works?"
6. A belief in authorities because of their status: because a particular pundit has expressed a particular opinion, it must therefore be so. Prince Charles has promoted homeopathy.
7. An acceptance of special pleading: " It is not given to us to understand."
8. Allowing your intelligence to be insulted, if you are asked to accept any of the above.

Differentiating power of evidence

The above suggests it is possible to differentiate between beliefs and scientifically based facts. Although extremes of each are irreconcilable (eg. I believe the moon is made of green cheese, but you know {have scientific evidence} it is made of rock), the task of science is to obtain evidence that clarifies grey areas between beliefs (which science terms hypotheses) and scientifically sustainable facts.

Quality of evidence

Evidence must:

1. Be confirmed by others acting independently, and perhaps after having carried out their own separate investigation designed in a different way.
2. Comprise a sufficient number of well-documented observations: anecdotal evidence is unacceptable, and should be reserved for hypothesis generation.

3. Withstand substantive debate and repeated attempts at contradiction. Indeed contradictory factual evidence should have been sought and not found.
4. Have an underlying logical explanation. Explanations may contain many links but if only one such link is tenuous than either the explanation is partially or wholly wrong, or the evidence is suspect.

There must be a realisation that some evidence is dynamic, and evidence obtained at one time or at one place may not apply at other times and other places.

Some belief systems will fail to provide answers for all or perhaps any of these criteria. This does no mean that their beliefs are worthless, but it does mean that people should continue to doubt and to question those beliefs, and keep on with a demand for evidence gathering before taking any action.

Problems with interpretation of evidence

1. **Gullibility error**: everyone tends to observe what they expect or, in retrospect, think they have observed what subsequent reflection suggests they ought to have observed.
2. **Inductive reasoning error**: the inferring of general principles from particular instances, may be misleading.
3. **Deductive reasoning error**: the inferring of particular instances from general principles, may be similarly misleading.
4. **Word error:** assuming that words mean the same to others as they mean to you: strict definitions of terms should occur at the start of any hypothesis.
5. **Sincerity error**: substitution of sincerity for evidence may occur, sometimes inadvertently. Millions of people have died for sincerely-held beliefs for which there was no evidence. One hundred and twenty five individuals died for each word in Hitler's Mein Kamf.
6. **Conformity error**: even if a lot of people believe in something this does not necessarily make it true.
7. **Availability error**: the most memorable occurrence affects judgement. "Halo error" occurs when readily available "good" observations outweigh less readily available counterbalancing "bad" observations.
8. **Cause and effect error**: failure to realise that exposure to the cause should always precede the effect. Retrospective identification of patterns among a large number of observations is risky. Observation should be used to generate a hypothesis and then this should be tested specifically. Some association will emerge by chance if a large number of different observations are systematically compared "data trawling."
9. **Restricted reasoning error**: reasoning from effect to cause using one pathway without considering other possibilities.
10. **Self confidence error**: expressed in the arrogant statement "There is no other explanation."
11. **Association error**; assuming that association is the same as correlation. There are many varieties of this particular error.
    a. **Primacy error**: assessment of later material is affected by prior exposure
    b. **Unrepresentative error**: conclusions are reached from anecdotal, related and unrepresentative observations "I had a patient once who… and therefore I now…
    c. **Assuming significance error**: concluding that evidence is significant when it is only caused by chance.
    d. **Coincidence error**: coincidences are bound to happen as a purely statistical phenomenon. Striking they may be, but significant they may not be. Even random number tables contain totally meaningless but seemingly non-random sequences.
    e. **Total logic failure**: the setting out of syllogisms that do not pass the scrutiny of logic, for example a real example in the early days of AIDS "A high proportion of patients given AZT for AIDS died, therefore AZT is harmful.
    f. **Ignoring evidence error**: inconvenient or irritating evidences are conveniently forgotten or judged irrelevant or as unrepresentative aberrations.
    g. **Confusion error**: failure to exclude evidence that is irrelevant and thus confusing. Differentiation between confusion error and ignoring evidence error may be difficult.
    h. **Focussing error**: attention is restricted to positive findings.
    i. **Analysis failure error**: collected evidence suggests that there is no correlation but a subgroup might show a correlation.
    j. **Confounding error**: failure to realise that there may be confounding factors in which the association is not between two entities, but rather that both share a common cause, for example a high alcohol intake is associated with a high rate of lung cancer, but alcoholism is not causally associated with lung cancer but both are associated with smoking.

Specific problems with alternative medicine
Patient satisfaction with alternative medicine regimens is high. At least five branches of alternative medicine, acupuncture, aromatherapy, herbal medicine, homeopathy and osteopathy, adopt a holistic approach in that remedies may vary from patient to patient and are individually tailored after in-depth assessments of diet, exercise, state of mind and other less definable factors in the patient to be treated. Unfortunately the results induced by alternative medicine, especially those brought about by holistic approaches, such as well being, are almost entirely subjective and it is difficult to assess them in whole or in part. That an intervention makes people feel well does not imply that the intervention has a direct and specific effect on a specific

condition. Far less should we infer that an intervention that makes people feel better is necessarily one that should be labelled as a medical intervention or a medicine. If I am given £1000 I will feel better, but this could not be considered a medical intervention.

An evaluation of the large number of alternative medicine interventions poses several problems. Alternative medicines are often marketed without safety trials (which may be irrelevant if there is no scientific basis on which to expect adverse effects), and with strong claims of therapeutic effects. Challenge to these claims usually evokes suggestions that scientific medicine should investigate – but the lack of a scientific basis of certain alternative medicines would be likely to render such potential investigations a waste of time and money.

Some may ask "If alternative medicine works, does the mechanism matter?" The answer is a resounding "Yes, it matters very much!" *if there are to be further developments*. The lack of a scientific basis may be the reason that some alternative medicines are stuck in ancient times and have not progressed or evolved in centuries, the excuse being that it is "the knowledge of ancients" passed on by lore and tradition. If, say, all homeopathy had a scientific basis then evidence should have been sought that would enable us to dismantle the current "Mega dosage" pharmacology.

Some alternative medicines have been successfully and appropriately incorporated into mainstream medicine. Drugs such as digoxin (for heart problems) and quinine (for malaria) spring to mind.

Problems with scientific approaches
1. **Evidence is based on observations**: we do not all experience that same world of evidence, or at least experience it in an identical fashion: some of us are colour-blind, some of us are tone-deaf, some of us are dyslexic.
2. **Beliefs may be scientifically true but evidence may be unobtainable**: more commonly science can only provide degrees of approximation of uncertainty. But this is a start.
3. **Reductionism error**: it may not be possible to reduce every complex situation to its pieces by concentrating on the pathways from effect to cause. Reducing a thing to its components may give no idea of its function as a whole.
4. **Science may not, indeed usually does not, provide absolute answers**: we often use statistical techniques to call the odds on what we chose to accept as acceptable evidence.

Shared problems of science and beliefs
Some scientifically based evidences on further investigations turn out to have been beliefs, and some beliefs turn out to be scientifically based, but only once they have been investigated.

Both beliefs and the scientific approach presuppose that a hairy bi-pedal life form, living on one planet, circulating round one of at least 100 billion stars, in over one billion galaxies, can identify ultimate truths. This is literally arrogance on a cosmic scale. Beliefs offer certainty and almost invariably reassurance. In contrast the scientific approach presupposes that, by repetitively asking "Why?" ultimate questions can be answered. This is incorrect.

The ultimate question for both beliefs and the scientific approach is "What happened at the instant of creation, at the Big Bang (for which there is overwhelming but never certain evidence – it cannot be disproved that everything, including false evidences, was created on the 8th November 1946 (my birthday and thank you for your interest). Sciences such as physics and astronomy have knowledge of what happened to within nanoseconds after the Big Bang but no one can know what happened at that instant because scientists believe everything was made out of nothing (Davis P. What happened before the Big Bang? In: How things are. Brockman J, Matson K (Eds), Weidenfield and Nicolson). We can only have untestable hypotheses as there will be no evidence that could be tested – how could there be if there was nothing there at the instant of creation?

So both the scientific and belief approaches share the last (actually the first) laugh. At the instant of the Big Bang, science and beliefs are equally valid and the only scientific Answer to the Ultimate Question "Why?" is "Why not?"

THE NHS
I believe NHS provides an outstanding health care system, free at the point of need, and which functions from cradle to grave. The focus on minor problems should not obscure the many major achievements but there are problems.

Reasons for poor NHS morale
I think there are six major problems.

Firstly, NHS workers fall into one of two broad categories, those who are people orientated and those who are technology orientated. Those who are primarily people orientated will have been attracted to health care for emotional motives and a desire for inner warmth when helping people, and the modern focus on technological care will not necessarily fulfil these needs. Those who are primarily attracted to the technological aspects of care will focus on parts of people and having to deal with whole people and might detract from fulfilment of their needs. Plainly NHS workers have to find their ideal balance between these two styles of care so that demoralisation does not occur, but the ever-changing demands of patients and high technology care make this difficult.

Secondly, patients used to be grateful, but this sentiment, perhaps not unreasonably has been replaced by expectations "rights." Now everyone presumes they should have every conceivably relevant investigation or treatment. As a vague socialist I find it dissatisfying that patients who have contributed little to society seem to be more successful at obtaining their rights. Those who know how to play the welfare system often arrive in taxis whereas the elderly who have paid a lifetime of taxes and fought in world wars often arrive after negotiating several bus changes.

Thirdly, the media focus on perceived failure of immediate availability of highly expensive new drugs almost always for a minute minority and often fails to mention all the support services that we all (including such minorities) have routinely received that enable the need for such drugs to become apparent in the first place.

Patient rights seem to be expanding to cover therapies for situational or social unhappiness and now patients often want the NHS to treat unhappiness as if it were a medical disorder, in effect using the NHS as if it were a National Happiness Service.

Fouthly, clinicians are encouraged to accept management roles and budgets. Some do accept such roles and successfully combine clinical and management roles. However these successful clinicians are an atypical breed, often doing the equivalent of two jobs. Inevitably they are highly energetic workaholics. It may be counterproductive and demoralising to expect the majority of typical clinicians to emulate this minority. Clinicians in management have two incompatible roles. *Clinicians* should try their best for each of their patients whereas *clinicians in management* also have to deliver the greatest good for groups of people. The management side of clinicians in management may have to tell their patients "In the financial circumstances we cannot afford treatment X" but their clinical side will inevitably tend to overspend. Let me put this more strongly. Clinicians should always attempt to get maximum resources for their patients. Surely it should be non-clinical managers (ultimately the government) and not clinicians who should tell the public that certain demands by patients **an**d their doctors should not be met? Clinicians in management are treading a dangerous path and may run the risk of becoming more familiar with spreadsheets than bed sheets. I quote the Health Service Journal. "You stick the buggers in clinical directorates, teach them how to count, and tell them to make cuts[2].
The recognition of the conflicting but equally legitimate roles of clinicians and managers would help the everyone but especially the public, who pay for the NHS, to decide priorities at the ballet box.

Fifthly, the NHS gives people health care free at the point of need and inevitably there will be escalating demands with escalating costs. Keeping within budgets often demands "efficiency savings" which are the euphemism for cuts in service that some clinicians in management deliver rather than rocking the boat. Enoch Powell, when Minister for Health, realised that escalation of health care costs was inevitable and concluded that a major way to limit expenditure was by having waiting lists which, paradoxically, clinicians are told to shorten. Governments always claim the NHS should have taken action earlier to avoid overspendings "as would occur in any other business organisation" thereby failing to make the crucial realisation that overspent budgets in business are acceptable if monetary profits result. In a national health service only patients should profit. Some say the NHS should not be a political "football" but it (like education, defence, and maintenance of law and order) are the four major footballs that politicians are elected to kick around.

Sixthly, for many clinicians there is the terrible burden of having to ensure that they are not doing harm by striving officiously to keep people alive. Given medical progress with increasing life expectancies, patients will have to be helped to face up to the need to define when they would want palliative and not high technology care. This failure will continue to hinder delivery of appropriate care for people nearing the end of their lives. Patients may fear death as may doctors but it behoves us all to decide when our medical care priorities change. Attitudes must change if we are to avoid the "Old Man River Syndrome," in which people are "Tired of living but scared of dying." I am outraged at treatments given to some patients who get admitted to acute hospital units by locum or deputising GPs who, because they often know little about the patient, admit near end of life patients who have had a recent deterioration because it is the easy option. The admitting hospital doctors have no idea how far they should strive. The result? All possible treatments are given "striving officiously" whilst attempts are made to discover from patients or relatives what should have been appropriate. I believe all patients who are obviously not long for this world should have, as a routine, agreed written agreements defining the extent of care they wish should they become unwell. Doctors responsible for patients in end-stage life situations are failing these vulnerable patients by failing to obtain such agreements when their condition is stable. It is my strong impression that most such patients do not wish such discussions at the time they are admitted to hospital acutely unwell.

How do doctors respond to these problems?
Many clinicians working on the shop floor of medicine often remark on the uncertainty engendered by the continual change of management techniques and structures "innovations" imposed on them from on high "All we have is perpetual change. We have seen it all before" But perhaps perpetual change is one of the necessary ways in which large organisations like the NHS avoid stagnation. But perpetual change has to consist of recurring cycles of similar innovations because there are sadly relatively few totally new management initiatives. Clinicians seem to react to perpetual change in two ways.

Those with insight realise that perpetual change is the game they are playing and that perpetual change will never provide continued stability. They engineer their position accordingly so that they can move seamlessly through successive innovations

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[2] . Editorial. Smile at a Doctor Today. Health Service Journal 7th April 1994:13.

"I was a supporter of (previous change) but now we can build on that with (the new) change." In this way perpetual enthusiasm is possible and these insightful clinicians accumulate favour with successive managements and politicians and they can, if they tire of clinical practice, transfer to the management ladder and can then hand down "new" innovations of their own.

The naive are the clinicians, mostly young, who throw themselves headlong into the latest change without realising the perpetual change nature of the game. "We should commit ourselves wholeheartedly into (insert latest change) which will ensure stability and thus be the answer to all our problems." Their enthusiastic faces, with twinkling evangelical eyes of enthusiasm is a joy to behold. Sadly they gain only temporary stability whilst "their" change is predominant. Most feel disenfranchised and not a little disillusioned when the next change comes along. Innovations in my clinical lifetime included clinical governance, clinician fund holders, GP Cooperatives, Primary Care Groups, Resource Management, GP purchasing consortia, General Management and Trusts.

My advice for most clinicians is for them to resemble the Vicar of Bray who, in the song that bears his name, carried on doing his job to the best of his abilities no matter what brand of Christian innovations were temporarily in the ascendant.

"And this is the law, that I'll maintain
Until my dying day, Sir,
That whatsoever King may reign
I'll be the Vicar of Bray, Sir."
(the Sirs in question in the song were Kings Charles, James, William, George and Queen Ann. The Vicar of Bray was in effect an ecclesiastical clinician and survived to benefit his patients, whilst some other vicars who committed themselves wholeheartedly to a new change were literally consumed by fire for their trouble.

GENETIC ENGINEERING: THE HUMAN GNOME PROJECT
Conservatives of all persuasions worry themselves about the implications of the exponentially adventurous exploits of modern genetic engineers. They are right to worry. History suggests that, if something can be done, then someone, somewhere, sooner rather than later, will do it, no matter what anyone else thinks. Inevitably human attributes will be modified. But who shall take the lead? It might as well be me.

There are many simple design faults in humans (which should show creationists that the creator was *not* a good designer) which should be corrected. Here are a few.

The airway and food swallowing tubes cross over in the neck. This will be corrected. No more inhaled peanuts!

The retina has the nerve tissue in front of the light detecting tissue. This will be reversed.

Hair on the head is mostly useless (although I am told that, for depressed ladies, a perm is as good as ECT). Insert a few plant genes and hair could photosynthesise. Eyebrows will be incandescent to enable reading in the dark.

The upright posture is associated with low back pain. A bit of genetic engineering and, hey presto, future generations will be quadrupeds.

Bodily fluids will be flavoured. Perspiration will be perfumed. Other fluids could be chocolate flavoured, enabling President Clinton… Oh never mind. …

Metabolism and excretion of alcohol will be made proportional to the blood levels such that blood alcohol levels cannot exceed safe limits.

The genital and reproductive tracts would be better geographically separated and childbirth will be made less painful. In fact females will be genetically engineered to lay eggs which, naturally enough, will be hatched by midwives genetically modified for this specific purpose.

Stomach size will diminish in proportion to the body weight, in order to reduce the current epidemic of obesity.

What will the genetically modified committeemen (GMC) have to say about all this? Your guess is as good as mine.

TERRORISM
There are three pathetic aspects of suicide bombers.

Firstly, the sad self-judgement of terrorists is that they have nothing positive that they can contribute to worldly life. Nothing to their community, nothing to the world in general, and nothing to the children some of them deserted. What a self-condemnation. Even if they go to heaven.

Secondly the terrorists sad lack of realisation that terrorism does not work. Nothing much changes, and certainly nothing for the betterment of their cause. People are hard and adaptable. They cope. What good is terrorism achieving in Iraq or Israel, New York or London? What good is doing for the terrorists' homeland or for their beliefs, whether political or religious? Kill 0.00001 percent and injure 0.00875 percent of the population of London and, I say this with greatest sympathy for those who died and their loved ones, life goes on much as before. Worse still, terrorism reinforces the determination of the communities affected by the terrorism. Did the Blitz persuade Londoners to give in? Even if terrorism did work, would you want them to continue the slaughter until everyone (or rather everyone that was left, certainly a small number of individual) thought exactly as they did?

Thirdly, their sad lack of insight of those who actually commit terrorist acts. Older men (mostly) are sending younger men as cannon fodder. Why is it that old men, who have had their lives and children, do not sacrifice themselves? Osama wherewas your act of martyrdom? Suggestions for this follow.

Mass murders by suicide bombers causes resentment, people are greatly affected emotionally, and resistance is reinforced. Terrorists should use their imagination. Spectacular suicides without injury to others will greatly affect people emotionally and may shame observers into addressing the problems and/or beliefs of those who committed suicide. Question by little Johnny. "Mummy, mummy. Why did those men on the TV kill all those people?" Answer "Because they are evil crazy people who want to force us to think their way by threatening us all. We must not give in." Little Johnny will inherit this message for the rest of his life. Better a question "Mummy, mummy, why did that old man kill himself in front of so many people?" Answer. "Because he sincerely believed that our society is unjust" And little Johnny will have to be given a good answers to his next question "Why did he think that and what is wrong with our society?"

Has 9/11 done anyone any good? For those (perpetrators and victims alike) who died, their loved ones, for Islam, for Arabs, for the world? If there is a worthwhile God with any sense of judgement surely victims and perpetrators cannot share heaven.

Fundamentalists of the Abrahamic religions (Islam, Judaism and Christianity) should take the lead and combine to agree some basic principles. How about "Thou shalt not kill." A command from God. Only four words. Each word one syllable. Incapable of qualifications, no ifs, buts and interpretations. It's quite simple. I believe that it is in one of their holy books, but the evidence is that they think it rubbish because they all treat it as a suggestion that can be ignored if we don't feel like it."

Fundamentalists to their no doubt deeply suppressed embarrassment have not triumphed so they think that things will have to get worse before their belief system is exalted. Because, for secular reasons, things are not getting worse they then believe that they have to make things worse to hasten their triumph. This inevitably means that they are not bound by worldly laws but have the freedom, without any personal sense of responsibility to commit any atrocity. Fundamentalism inevitably begets terrorism.

MONEY IN CRISIS. TRUST ME, I'M A REGULATOR
I wrote this article as a protest against the blatant self-interest of almost everyone who has substantial amounts of money. I sent it to several newspapers because I thought that there was substantial press freedom. What I naively failed to realise was that I was writing about also included owners of newspapers. The alternative explanation is of course that I am paranoid and my thoughts were not worth publishing. You choose.

Most people want to be rich and will use Adam Smith's guiding hand of the market to guide cash into their pockets and this, as the current financial crisis demonstrates, will from time to time cause hardship for everyone. Most of us have to trust our democratically elected governments to enact regulatory laws to protect the average citizen. There are five major Smithsonian pickpockets within the financial system.

Banks were allowed too much freedom by regulators and amalgamated high-risk investment banking and high street banking. The government, the regulator-in-chief, guaranteed the latter so that when the former failed the combination had to be rescued with taxpayers' money. Regulators who should have understood financial risks did not (Gordon Brown as Chancellor of the Exchequer said "Many who advised me… favoured a regulatory crackdown. I believe we were right not to go down that road").

Rich individuals or institutions (particularly banks) were moving escalating amounts of money hither and thither seemingly regardless that it represented less and less of actual worth or assets and this inevitably produced overstated valuations of almost everything. Almost none cared that this bubble would burst because their short term remuneration was linked to "profits" that were mostly financial creations and not gains in true value. Ultimately Hubris had to meet Nemesis and generalised stagnation and recession resulted when the harbinger sub-prime mortgage debacle exposed the vulnerability of the whole system,

Tax havens allow the rich get round the rules of their home democratic societies. It is estimated that the rich 0.001% of the world's population are hiding $21 trillion in tax havens.

Hedge funds parasitically enrich themselves whilst disadvantaging struggling companies. Hedge funds produce no goods or services but operate by paying a fee (say £50,000) to "temporally use or borrow" (say £500,000) worth of shares (say, for three months) in anticipation that the share price would fall shortly after purchase. After purchase shares are immediately sold (for, say, £500,000). If share price do go down the hedge fund buys them back, often at a much lower price (say £300,000) than they had sold them. The shares are then returned to the original owner. The hedge fund has only paid £50,000, but has gained £200,000 (£500,000 minus £300,000). Hedge funds using tax havens get even richer.

Money traders parasitically use transfers of huge sums of money that only numerically represented goods to take advantage of small changes in differential international interest rates (arbitrage).

Tax avoidance is still rife and indeed seems part of human nature. That does not make it right.

What should be done?
Investment banks should be totally separated from high street banks. Banks should have to possess enough assets, as judged by governments, to make bailouts highly unlikely. Transfers of money should be taxed, especially transfers to tax havens (including the City of London which in effect functions as the centre of the tax haven system), hedge funds profits and money traders should all be vigorously taxed. Tax avoidance schemes should be prevented by appropriate legislation. Financial service companies should be regulated so stop them making money for themselves rather than their clients, an activity admitted by a director of Goldman Sachs.

Other initiatives could include making everyone actually pay appropriate tax rates (our Queen thought this fair). Taxing goods or services that provide real added value is crazy and VAT could be scrapped and purchase tax reintroduced, particularly on goods or services that do *not* add value. There should be mandatory transparency about the use of lobbyists whose aims is to influence regulators and also transparency about access to senior government in exchange for party donations.

Dubious activities by individuals and institutions should be legally regulated, officials made accountable and, if appropriate, sent to jail for transgressions.

You might ask why none of this has been done. Regulators were and are happy to be incompetent or powerless because many of them expect that, after leaving regulatory office, they will be paid obscene amounts (as advisors to the rich how to become richer by avoiding regulation, from Board memberships, from directorships, from consultancies, and as givers of lectures at thousand of pounds per hour). It seems it is not even necessary to have left office. A director of HM Revenue and Customs "responsible for curbing tax avoidance" is on the Board of a £2.7 billion company in tax haven Guernsey.

The rich and powerful claim that, imperfect though it is, we all would be poorer if regulation were to be increased. They would say that, wouldn't they? But where is the numerical evidence for this? Certainly there is evidence that we are all worse off as the result of their expertise.

Some will no doubt say all the above is naïve. But where have our current experienced and sophisticated regulators got us? I suggest we might all be better off if we encourage them to spend their time on sex and travel and appoint impartial regulators.

IMMORTALITY? NO THANKS
One the questions I used to ask at the old fashioned MRCP vivas was "What should I do in my attempt to live forever?" As far as I can see I should take an aspirin, a statin, perhaps an ACE inhibitor, moderate exercise, and (the only therapy possessing pleasant side effects) a glass of wine a day. However 120 years is probably the maximum lifespan achievable because cells in culture, unless malignant, divide about 50 times and then stop. Even before then we degenerate and tissues that were flexible become stiff (eye lenses for example) and whilst tissues that were stiff become less stiff (I refer to bones: you may have other examples). Would it be worth living, say, nine hundred years when, to quote Ira Gershwin's lyric "Methuselah lived nine hundred years. Who calls that livin' when no gal will give in to no man who's nine hundred years?" Despite these pieces of bad news survival times have increased and, short of fatal accidents, look set to continue with the inevitable consequence that the elderly will accumulate multiple tissue dysfunctions requiring an accumulation of long-term treatments.

What should be done, or not done, when patients with significant chronic debility present with acute life-threatening illnesses and there is no advance directive? It was easy in the past. Pneumonia was "The Old Man's Friend " and "Not to be resuscitated" was the understood default position of those admitted to geriatric wards. Patients were allowed to slip away without their noticing. These covert but humane understandings now only apply in those transferred to hospice units.

In theory all patients with chronic illness or above a certain age should face up to their responsibility and make advance directives. It is as important as making a will. These days it is not good enough to ignore the issue and lumber doctors with the responsibility – unless you accept in advance that you will trust whichever doctors will be treating you – but no one wants to allow us such autonomy, especially since Shipman. In practice few patients make advance directives, perhaps anticipating they might change their minds once they entered into the shadow of death.

In practice most patients with significant chronic debility complicated by rapid onset life-threatening illnesses get admitted to acute receiving units where patients require great courage to resist the default position of doctors to do all they can. Few patients eschew Dylan Thomas' instruction to "rage against the dying of the light. Do not go Gentle into that Good Night." Few will decline 100% treatment even though they run the risk of ending up with Shakespeare's undignified "Sans teeth, sans eyes, sans tastes, sans every thing." Few will adopt Lennon and MacCartney's approach "When I find myself in times of trouble Mother Mary call to me, speaking words of wisdom, Let it be, Let it be." In my experience the majority of patients will not give such guidance to their carers and do not wish to contemplate, confront or even discuss their impending mortality and how it might best be handled. Some of course will be too ill to do so.

Often patients with rapid onset life-threatening illnesses seem, to quote Jerome Kern's Ole Man River, to be "Tired of living but scared of dying." Patients of a religious persuasion are perhaps less scared of dyin' as there are a wide variety of Gods offering prospects of immortality. Incredibly some religions offer rejuvenation of somatic decrepitude, others celestial choirs, and some 72 virgins (the mere anticipation of such a workload would finish me off). For the non-religious there may be no hope of immortality or resurrection but perhaps there is peace in envisioning a "dreamless sleep" with return to the non-existence that preceded the highly unlikely succession of highly unlikely events that brought them into existence in the first place.

Both the religious and non-religious should realise, like those who sang the song "The Green Leaves of Summer" at the Almo, and who knew that they would die in the forthcoming battle, that there is
"A time just for livin',
A place for to die.
'Twas so good to be young then, to be close to the earth;
Now the Green Leaves of Summer are callin' me Home."

DYSFUNCTIONAL PYRAMIDS

This deals with the effect that the European Working Time Directive had on the medical profession, but the principle of problems with hierarchical pyramids can be found in all organisations.

The European Working Time Directive told the medical profession that they should not work more than a certain number of hours each week (even if they want to). It dramatically reduced the hours of doctor-patient contact, particularly in hospital practice. Would this make any difference? In some specialities, surgery for example, practical experience is important. With restricted hours on duty there is a feeling that some surgeons in training are being exposed to, rather than getting experience in, matters surgical.

Some with management responsibilities tell us that the reduced hours will have no effect on the service delivered because new efficiencies will occur. It seems that clinical experience of books and lectures will uniformly replace the need for clinical experience of patients. Indeed the Working Directive was touted as a wonderful opportunity to redesign service delivery. Some doctors worked more that the agreed maximum to maintain services and certainly they did not wish to be treated as time-contracted trades' people. Why did no one "in charge" object but rather left those lower down the power pyramid to sort it out?

One such wonderful redesign opportunity was the Hospital at Night project. Instead of each clinical team offering 24-hour cover there were to be a reduced number ("skeleton teams" seems a grossly inappropriate label) of generalist doctors on-call at night to troubleshoot problems, whilst their specialist colleagues obey the Directive.

So why were there no significant protest? The answer is that the medical career structure is hierarchical in which leadership and authority cascade downwards from the top of the pyramid whilst career progression progresses upwards from the bottom of the pyramid. This pyramidal structure is the rule for large organisation, rather than the exception.

Things go wrong because problems reported upwards by those on lower levels of the pyramid are enmeshed and suppressed, because their immediate seniors to whom such problems are passed regard it as one of their career-enhancing responsibilities to solve lower level problems and therefore do not pass them upwards to their seniors. Even if they do pass them upwards, their senior regards it as one of their responsibilities to solve their lower level problems and not pass it upwards to their senior… and so on. The result is that those on higher levels of the pyramid can be blissfully unaware of grassroots problems.

Perhaps there is no alternative to such dysfunctional pyramids but we must have in place mechanisms to avoid suppressing awkward realities. Otherwise the unenlightened will never see the light.

THE BIG BANG

Our universe started with a Big Bang about 13.7 billion ago. It has taken this time before sufficient intelligence developed and began to wonder about what happened at the Big Bang.

Although we know what happened immediately after the Big Bang no one can know exactly what happened at the instant of the Big Bang. We are now trying to investigate the Big Bang at the Large Hadron Collider at CERN in Switzerland.

These, or some future investigations, could conceivably cause another Big Bang and in 13.7 billion years or so another intelligence might do the same. An experimentally induced Big Bang might simultaneously destroy us and create a new universe. This would constitute a mechanism for continual creation events occurring every 13.7 billion years or so (it also might explain why we might be the most advanced civilization in our universe - any more advanced intelligence could have blown us away).Perhaps the Pope was right for two reasons when he told Stephen Hawking that we should not investigate the moment of creation. Those who create a universe would seem to deserve the label Gods. The Gods would be dead and everything was an accident.

If repetitive creations happen every 13.7 billion years or so how was this repetitive cycle started off? Perhaps there never was a start. Presumably a Big Bang would destroy pre-existing matter, energy, time and space and each Big Bang would be literally the first (of its) time.

MINIMISATION OF OBFUSCATION

It takes a brave fool to criticise government publications. My only excuse is that I criticise not the intentions, whatever they are, but rather the clarity of presentation. New collections of euphonious words which do not define what exactly is intended are metastasising. Prolix verbosity is transmogrifying without restraint. Some government publications can cause acute attacks of MEGO, the acronym for "My Eyes Glazed Over" which has been associated with plumbum palpebrae. To be fair some of the responses published by learned bodies are no better. Instead of pungent and effective rebuttals we have mellifluous and misleading statements that "some pedal *vis a tergo*" might be required to deal with official taurofaecalosis.

A composite example drawn from material on my desk. " The quintessential key goal is that our valued customers should make journeys of high-quality seamless patient focused are brought to fruition by the proactive drivers of patient care within effectively managed organisations utilising clinical governance, facilitated by enhanced emphasis on collaboration, leadership, partnership, multiskilling, interface developments, and new managed new initiatives. Multidisciplinary relationships will have to be forged for this definitive national innovation but local ownership is vital. There will be transition issues with inevitable periods of uncertainty during polarisation, prioritisation, and a number of important interconnected issues require clarification and integration to underpin a firm yet flexible long term resolution based on a succession of short term interventions. Barriers must be broken down and boundaries redrawn. Major shifts in working practice are mandatory, but should be introduced without compulsion so that, in retrospect, the envisioned substantial and significant improvements which are anticipated would occur without the need for preliminary retrospective reviews. Local task forces will be necessary to upgrade and pump prime the necessary impetus."

The reply, also drawn from material on my desk. " We positively welcome this initiative which follows on the substantial progress made in the light of the previous report on this important matter. We have discussed and debated for some time ("probably about 10 minutes" PDW) and have identified a number of points with which we are in complete agreement ("probably 0," 0 is a number, PDW). Obviously there will be some interim issues between the beginning and the end phases of implementation. There are community and hospital implications which require exploration and the accumulating dichotomy between upside and downside applications. We are certain, if we are not mistaken, that all members will, unanimously and without reservation(s) cooperate with the aims expressed once the minor stumbling-block issues are resolved to the satisfaction of all concerned."

What does it all mean? I think the official communication means "We want you to work more effectively" and the reply means "Watch this space/Dream on sunshine."

Why have these convoluted styles of writing evolved? I suggest that it is necessary because the government officials have to seem forceful yet flexible in order to continue a culture of perpetual change. The requirement for flexibility means that government edicts have to be a bit equivocal "fudged." Perpetual change is desirable (even though the journey around the wheel of change returns you to the same place) because organisations that do not change tend to stagnate.

There is a problem because perpetual change means that the previous enthusiasts become disillusioned as each required change comes with a covert implication that what went before was not good enough (fundholding and clinical directorates apparently "were divisive" for example. *In retrospect*. At the time and in prospect they were the definitive answer).

This causes "enthusiasm exhaustion" in those who have to implement continual changes. This is why many senior doctors rush to early retirement and that is why a perpetual supply of young bright eyed doctors with militant enthusiasm is needed. Either that or we need a supply of very old doctors who have seen it all before and wish to keep the journey around the wheel of change on course, so that perpetual change will always return to the original starting place rather than going off at a tangent.

To end with a positive suggestion. Management at all levels, including the government, should realise a basic truth - that people who are doing their best do not respond to criticism, including the repeated, covert implied criticism of perpetual change. They respond to offers of assistance to build on previous achievements.

ARE DARWINIAN PRINICPLES NOW EXTINCT?

Darwin's theory of evolution is one book long and, contrary to popular representation, The Origin of Species nowhere contains a succinct statement of the theory. To avoid fundamental misunderstandings any critique has to commence with what the writer understands to be the fundamentals on which the theory is based. The essence of Darwin's theory is that:

- There is a struggle for existence and
- Organisms possessing stable patterns of inheritance
- Develop occasional variations that
- Interact with the environment and
- Organisms possessing fitter variations are naturally selected for a greater chance of

surviving to reproduce so that over generations gradual *cumulative* natural selection "filters out" less advantageous variations to the ancestral organisms such that new species (descendants that could only breed amongst themselves) develop

PROBLEMS WITH DARWINISM

A successful theory should explain *all* occurrences within its domain. If exceptions occur then the theory has to be challenged and, if even *one* challenge cannot be rebutted or integrated into the theory, then a new theory is required. Darwin's theory does not accommodate several exceptions and there has been one new development such that the theory has to be reassessed.

Darwin's theory requires a struggle for survival. Darwinism supposes not just that the fitter variations prosper, but also that the less fit variations die out (either because of the competition with their fitter relatives or because the environment kills them off). Life may well be a struggle at times, but is it *always* a struggle, *always* a competition with the prize of survival *only* for the winners? Even with mindless organisms there is often cooperation rather than struggle. Cooperation occurs both within cells (it seems certain that mitochondria were originally pathogens who settled into cooperative symbiosis), between cells to form multicellular organisms, and within colonies, packs, and societies of organisms.

Darwin, in The Origin of Species, claimed "*Every* (my italics) single organic being around us may be said to be striving to the utmost to increase its numbers" and thought, like Malthus, that this formed the basis of the struggle for existence. This is not true now and probably was never totally true. The most obvious and notable exception to Darwin's theory, man, limits reproduction once population density reaches a certain level. And they do not do this at the behest of their genes. They do it to benefit themselves.

*Neo*darwinism is the use of knowledge, only available after Darwin had died, of the stable units of inheritance, genes, which occasionally develop variations (mutations). Some genes caused "their" organisms to be fitter than otherwise identical organisms. But what defines the fitness of a gene? The definition seems to be that the more apt "fit" genes survive to reproduce themselves thus, in effect, stating the obvious in retrospect that survivors survive. One of the requirements of a useful theory is that it should allow predictions to be made which can be tested. Neodarwinism explains a lot *in retrospect* but little in prospect.

Altruism, in which individual organisms sacrifice their existence for the benefit of others, implies that they do *not* struggle for existence. The attempted explanation rests on the benefits to their *species* of individual sacrifices "inclusive fitness" and particularly to their kin – "kin selection." With kin selection, so it is said, interests of genes predominate over interests of organisms so that some organisms sacrifice themselves and their own genes in favour of *relatives* if they think (and not all organisms think) that these relatives, and thus some at least of their genes that they share with relatives, will survive. The classical example of kin selection is bees. In beehives there are numerous sterile workers that, so it is claimed, work to perpetuate some of their genes by assisting their queen and her offspring. No one questions that they do this but do they do it *to perpetuate their genes?* Certainly no one has asked them! Evolutionists may call this kin selection but it would be better named kin *exploitation.*

Selection of genes by kin selection, by the way, presupposes the ability to recognise one's relatives, and the ability to modify behaviour. There is only one organism that can do both, but this organism invalidates Darwin's theory by thwarting natural selection. Humanity has been thwarting natural selection by influencing the future of our genes by quality of parenting, selectively aborting foetuses, and now we use genetic engineering to control our genes. The phenotype is determining the genotype. Thus we now are, as has been claimed, robots programmed to preserve selfish genes. We are not genetically predetermined. However the concept of genetic determinism is undoubtedly popular because it reduces responsibility for behaviour. We could imagine that Alan Clark, a British cabinet minister who published a set of uninhibited diaries which includes details of his serial philandering, might have justified his behaviour by saying "I am what I am because of what is in my genes" but he would have been referring, I think, to what was in his jeans.

Genes, if book titles are to be believed, act selfishly but plainly genes cannot have subjective views and might not function selfishly in all contexts even if they did. The neodarwinian selfish gene paradigm really ought to be qualified "When all other things are equal (which they often, indeed usually, are not) *some* genes function as if they were acting selfishly."

Natural selection can explain how major characteristics developed because organisms possessing favourable "survival to reproduce advantages" did just that. The problem is with *trivial* characteristics. How did the numerous relatively trivial characteristics emerge, unless they were linked, genetically or non-genetically, to something else more beneficial? It seems unreasonable to suppose that natural selection could operate to supply each relatively trivial individual characteristic. Perhaps then a whole package deal of trivial characteristics would make a difference? But in this case some trivial characteristics would have been along for the ride *in spite of* natural selection. But perhaps this only slightly diminishes the power of natural selection.

Contrary to popular understanding Darwin did not claim an exclusive role for natural selection "Natural selection has been the main but not exclusive means of modification." Natural selection obviously operates if organisms are simple, passive and unresponsive. But some organisms have been naturally selected to become complex and, once they became aware, *to any extent whatever*, that they could modify their behaviour (and thus ability to survive and reproduce) they would attempt to overcome natural selection. Thus, hiding in Darwin's concept of natural selection, is the seed of its destruction - if natural selection does its job, then an organism should develop that will resist natural selection. The fact that this organism has developed (here's looking at you) proves that natural selection had been operating *until we escaped its role.* By we I refer to those of us lucky to live in the developed world. The Grim Reaper operates natural selection elsewhere in the world.

Some evolutionist writers spend time (and destroy not a few arboreal ecosystems to produce books) debating whether evolution occurs by multiple small steps or by leaps (saltations), which punctuate otherwise stable equilibriums (Darwin favoured multiple small steps "accumulation of slight modifications…"). Probably both gradual and abrupt changes occur depending largely upon the extent of environmental changes. Send in an asteroid and the ensuing global winter will cause abrupt changes, both positive (allowing certain organisms to flourish) and negative (by extinction of other organisms).

The one new development that is making Darwin's theory outdated is the abrupt evolutionary saltation is occurring right now. Nearly all evolutionists (like those who live on the slopes of volcanoes who always seem to be the most surprised by an eruption) need to be informed that the accelerating transition from carbon-based species (organisms) to silicon-based species (computers) is an evolutionary eruption. Computers can outperform us in numerous tasks and carbon-based life will be redundant once computers control production of their own hardware and software and can integrate these abilities to allow them to cope with changing environments. Hopefully cooperation, and not selection, will then occur. Is it possible that, in years to come, computers will sit around discussing how on earth they evolved? Will they discuss an original carboniferous being which constituted the Gates through which silicon became the basis of their existence? They might even discuss the joys of information exchange between themselves to create even better computer offspring, in effect reinventing sex! Given interstellar distances it seems highly likely that, if we are visited by aliens, they will probably by silicon based, and likewise, if we visit other worlds (the nearest star would require a round trip of eight years at the speed of light, and who will volunteer for that?). I believe that computers will achieve (note the active rather than passive tense) consciousness.

A conclusion must be that Darwin's theory does not now apply to mankind (or at least those in the developed world) as we are able to replace natural selection and control both internal environments (notably genes) and the external environments that were the means of natural selection. Recently there has been much re-emphasising of Darwin's theory. I suspect that this is the often-observed occurrence that resistance to change is often maximal just before the change. Darwin's theory needs to be changed because there is a growing realisation that his theory is now not as comprehensive and all embracing as the retrenching fundamentalists would have us believe.

A POST DARWINIAN THEORY
Darwinism *has* been a successful theory and has *mostly* explained the route by which organisms, species, and humanity developed. We should be grateful for his insights but we have evolved to the point when Darwinism should not be patched up, but should be replaced. Darwin acknowledged artificial, natural and sexual selection but did not envisage that we would replace natural selection by artificial selection applied to ourselves. In fact the word natural in natural selection is a weasel word and allows many interpretations. *Anything* that occurs could be considered to be natural – no matter how unnatural you might like to think it. Stated simply the new theory must be **"Persistence of a population requires that each individual member should, on average, leave at least one offspring who does the same."** The population in question can be of chemicals, crystals, organisms, computers, whatever. The mechanisms by which any variations will occur and will be selected to survive will vary, and could include, kin selection, kin exploitation, abortion, genetic interference, control of the environment, meteor strikes, good luck, and bad luck.

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