X. HYPE PARADES AS SCIENCE

Most everyone has seen variants of the famous colored poster, shown below in line drawing. We are advised to eat foods from each of the Basic Four Food Groups to insure adequate nutrition. The two animal food groups, milk and meat, are said to be high in calcium and protein, respectively.

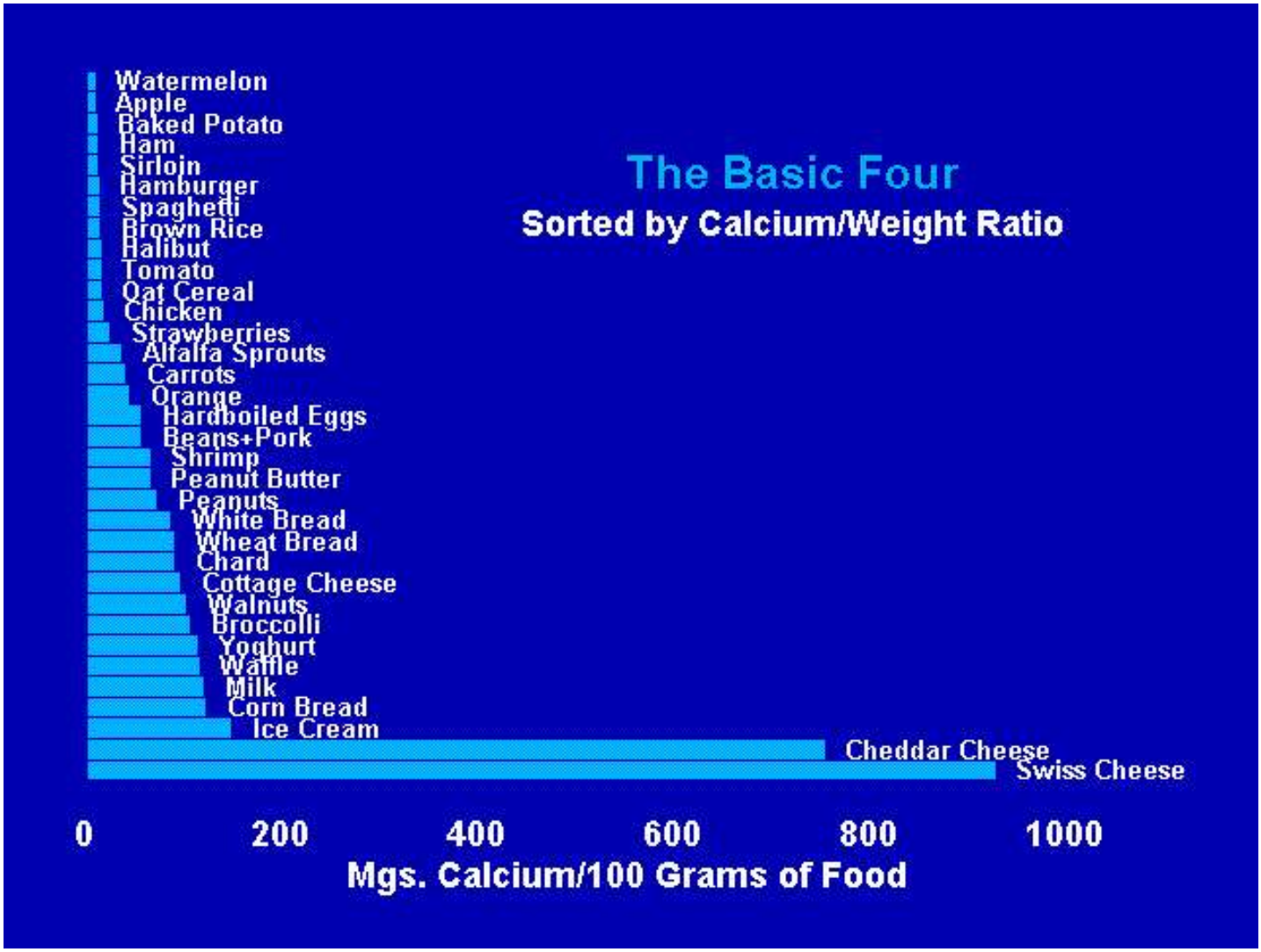
If we go to USDA Handbook No.8, some of the poster foods and some of their nutrients look like this:

Table 1.-Composition of Foods
100 Grams, Edible Portion

Food	Energy Calories	Protein Grams	Calcium Mgs.
Beef,Sirloin	313	16.9	10
Sunflower seeds, hulled	560	24.0	120
Broccoli	32	3.6	103
Chard,Swiss	25	2.4	88
Cheese,Swiss	370	27.5	925
Hamburger,Regular	286	24.2	11
Milk	65	3.5	118
Sesame seeds, unhulled	563	18.6	1100

Obviously cheese and milk are winners in the calcium department. Hamburger and cheese are good protein foods, while chard and broccoli aren't.

If we load *all* the foods[1,2,3,4] shown in the poster into a computer spreadsheet and sort for the foods with the highest calcium content we get the graph below:



Then we sort for foods with the highest protein content and get the graph on the next page:

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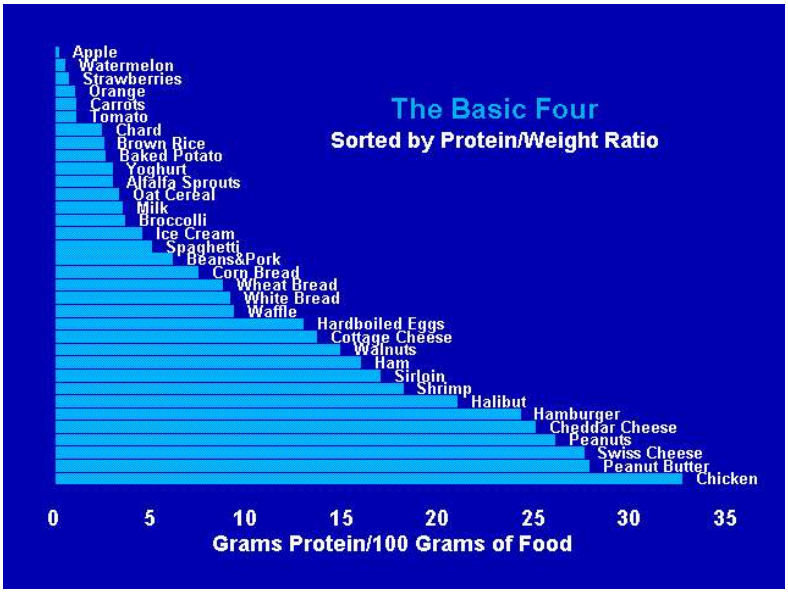
[1]United States Department of Agriculture *Nutritive Value of Foods.* Home and Garden Bulletin Number 72. U.S. Government Printing Office. Washington, DC 20401, 1981.

[2]See note 46. USDA #8.

[3]See note 1. Leveille.

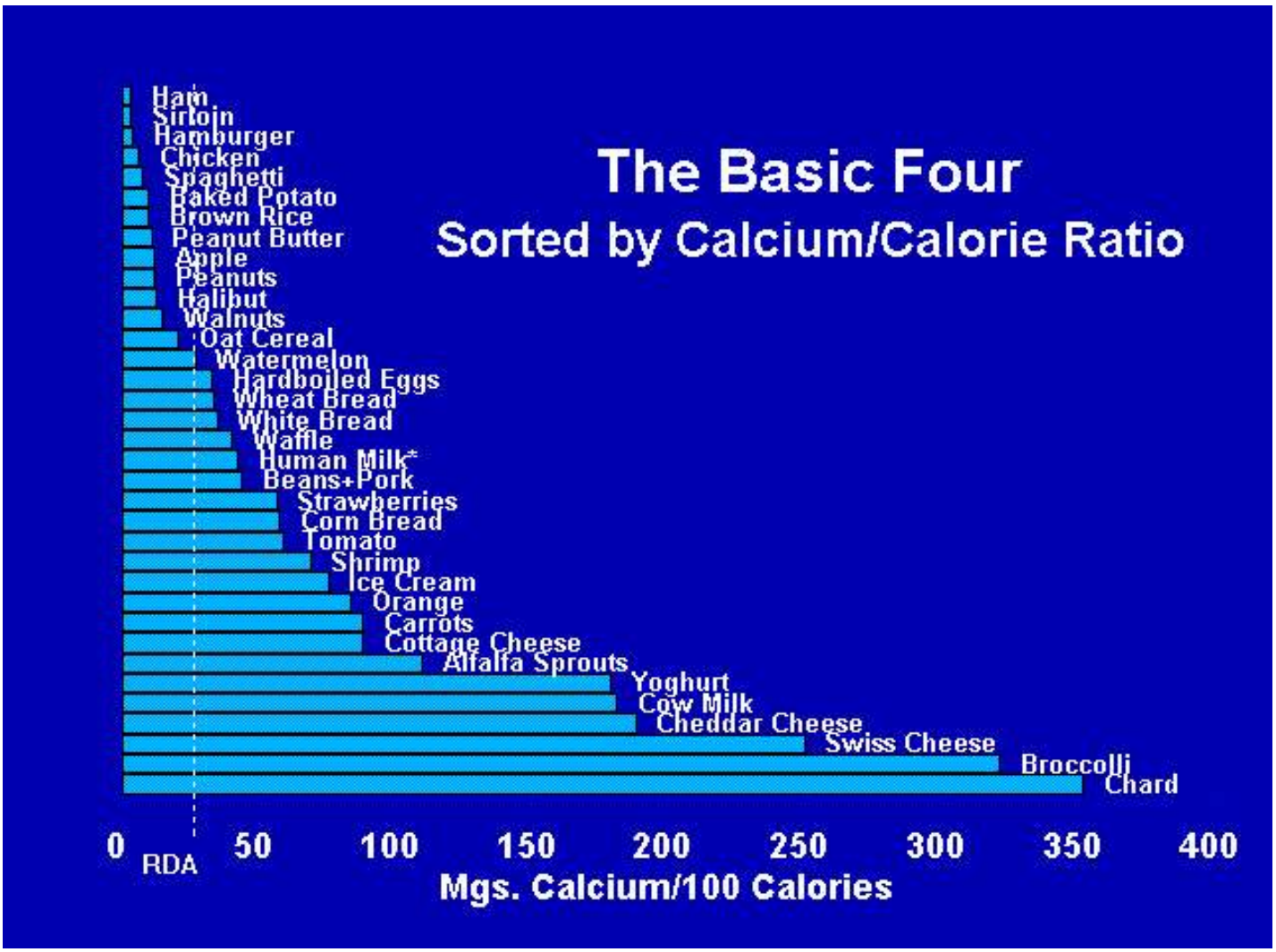
[4]See note 128. Bowes and Church.



It certainly looks as if the two animal food groups do have unique properties. The milk group dominates the calcium sort and the meat group dominates the protein sort, as advertised.

However, *the foods have been sorted by nutrient/weight ratio.* Suppose we sort for foods with the highest calcium/Calorie ratio instead. Significant changes occur. Broccoli and chard move ahead of cheese. If, in fact, one sorts the entire USDA data base by calcium/Calorie ratio,[5,6] about 24 leafy greens make the list ahead of the first dairy product.

The vertical dotted line at 33.3 mg/100 Cal is the ratio needed in the overall diet to meet Recommended Dietary Allowances (RDAs) of 800 mg calcium and 2400 Calories:



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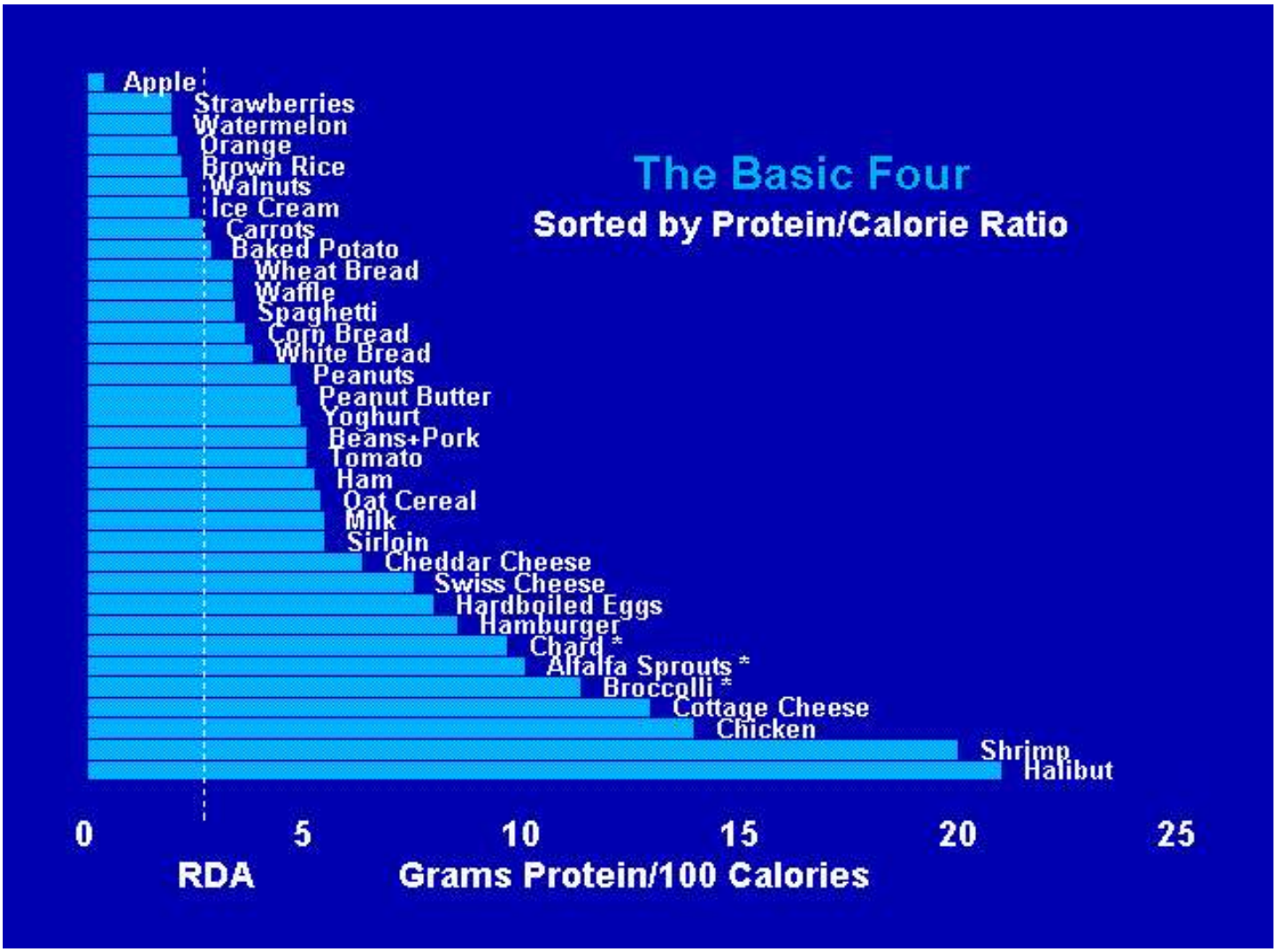
[5]N-Squared Computing. *Nutritionist II, v2.0* Silverton OR, 1984.

[6]Farrell, Carl. *Carl's Wizard*.(BASIC sorting program for Nutritionist II). Honolulu, 1987.

Sorting by protein/Calorie ratio produces more surprises, and vegetable foods (broccoli, alfalfa sprouts and chard) are scattered high among the animal foods.



The vertical dotted line at .023 gm/Cal is the ratio needed in the overall diet to meet Recommended Dietary Allowances (RDAs) of 56 gm. protein and 2400 Cal (~ 10% of Calories from protein). All the foods to the right of the line exceed the protein requirements, some by wide margins. If the entire USDA database is sorted by protein/Calorie ratio, only some fruits, nuts, and junk foods fall to the left of the dotted line.

Of some interest to protein-seeking vegans and Natural Hygienists is the fate of peanut butter, peanuts, and walnuts which are now below the leafy greens. The reason for this fall from grace is the same thing that drops sirloin, ham, and cheese. They're high in fat. Fat is lighter (specific gravity is .913-.945)[7] than water, the chief constituent of fruits and vegetables, so fatty foods will show up well in a nutrient/weight sort, but since fat has 9 Calories per gram, as opposed to 4 Calories per gram of carbohydrate or protein, these foods do poorly in a nutrient/Calorie sort.

"The job's not over until the paperwork is done," as the cartoon says, but the USDA never finished its paperwork. The USDA No. 8 sample, finished and rewritten, looks like this and chard and broccoli turn out to be pretty good foods after all:

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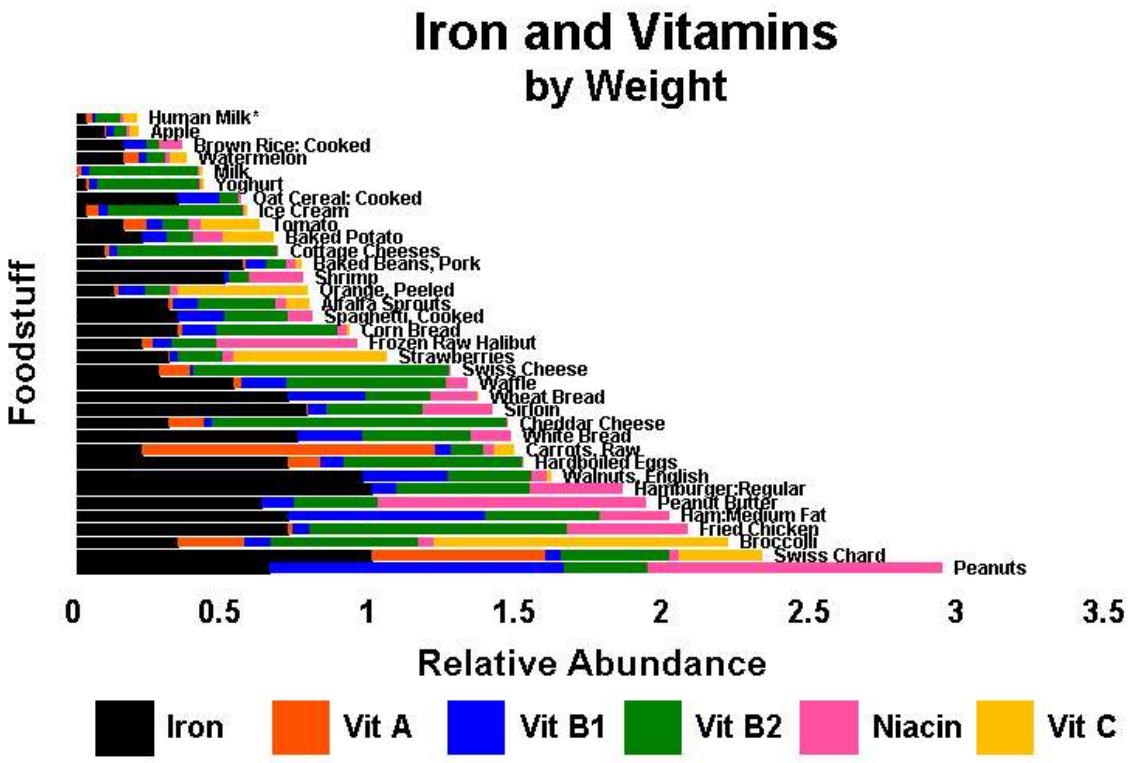
[7]See note 22. *Encyclopedia Britannica.* Vol. 13, p.527.

Table 1.-Composition of Foods per 100 Calories

Food	Energy Calories	Protein Grams	Calcium Mgs.
Broccoli	32	11.3	321.9
Chard,Swiss	25	9.6	352.0
Hamburger,Regular	286	8.5	3.8
Cheese,Swiss	370	7.4	250.0
Beef,Sirloin	313	5.4	3.2
Milk	65	5.4	181.5
Sunflower seeds, hulled	560	4.3	21.4
Sesame seeds, unhulled	563	3.3	195.4

The Basic Four poster also invites us to believe animal foods are a serious source of vitamins and iron. The stacked bar graph below shows the relative abundance of these substances, sorted by nutrient/weight ratio, and mathematically adjusted to keep all figures visible on the graph. Hamburger appears to have lots of iron, as suggested by the poster, and milk is a good source of riboflavin(Vit B2):[8]



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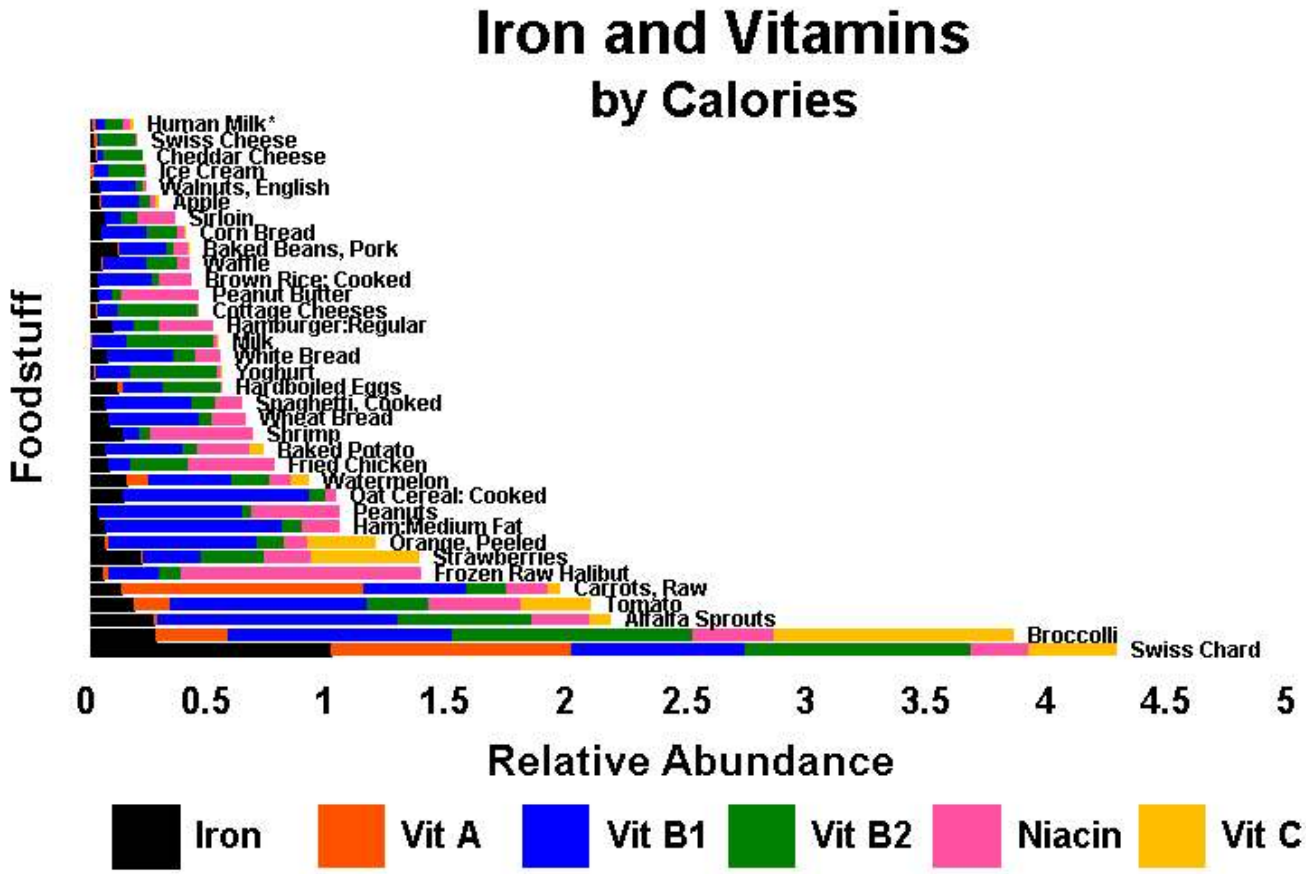
[8]Author's Note: This busy stacked bar graph was chosen to avoid six separate bar graphs. Since there is a wide variance between 4000 IUs of Vit A and 2 mg. of riboflavin, if all six secondary nutrients mentioned in the poster are to be visible in the same graph, the ranges for each nutrient must be normalized to 1 by dividing each nutrient value by the largest number appearing in that nutrient column. If one food led in all six nutrients, it would score a relative abundance of 6.

If we sort by nutrient/Calorie ratio, a different picture emerges. Dairy foods are no longer a remarkable source of riboflavin. Meats do not score well in the niacin, iron, and thiamin departments. Fruits and vegetables lead the way in all six nutrients:



Q.E.D., if foods are sorted and preferenced by nutrient/Calorie rather than nutrient/weight ratios, animal foods lose their clout and the whole "Basic Four" concept evaporates.

Well, which sorting method is right? There's no doubt weight is a quick way to find out how much of a given food you've got, but there's no RDA for weight in the diet since weight is not a metabolite or nutrient but a means of measurement. People do not eat until a certain weight of food has been consumed but rather until Calorie and nutrient requirements are satisfied. Acquisition of Calories is arguably the main reason for eating in the first place; the body is quick to send hunger signals if insufficient food energy has been taken in to run its metabolic pathways.

A complicated system of chemoreceptors throughout the body are believed to send nutrient and Calorie information to the hypothalamus which then regulates feeding behavior.[9] Nerve fibers in the throat and intestines monitor the Caloric and nutrient content of every morsel eaten which helps to determine the satiety point.[10]

It may well be that people eat what they want to eat regardless of what is advised, but if advice is to be given it should be physiologically sound. Now, a bowl of soup has about the same nutritional value as its dry ingredients, but under nutrient/weight sorting rules, the soup runs a poor second because of the additional

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[9]See note 98. Ganong pp 218-222.

[10]See note 204. *Science News* 1994;146:359.

weight of water. Let us here introduce, as an alternative system of nutritional analysis, the concept of "Percent of (RDA per Calorie)." It is that portion of the RDA of a given nutrient to be provided by each Calorie of the given food.

We will compare[11] a piece of sirloin steak, dehydrated sirloin, fresh spinach, and spinach soup, and present it as a revised FDA "Nutrition Facts."

Nutrition Facts

Serving Size: Irrelevant

% of Calories from:	Sirloin	Sirloin (Dehydrated)	Spinach	Spinach (soup)
Carbohydrate	0	0	49	49
Fat	29	29	11	11
Protein	71	71	40	40
Nutrient ·	(% of (Recommended Daily Allowance per Calorie)			
	(%)	(%)	(%)	(%)
Calcium	10	10	1633	1633
Cholesterol	376	376	0	0
Fiber	0	0	1187	1187
Folate	68	68	12737	12737
Iron	503	503	3585	3585
Magnesium	132	132	2978	2978
Potassium	329	329	3679	3679
Phosphorus	518	518	807	807
Riboflavin	273	273	1470	1470
Thiamin	112	112	691	691
Vitamin A	0	0	8868	8868
Vitamin B12	2474	2474	0	0
Vitamin B6	341	341	1297	1297
Vitamin E	0	0	2429	2429
Vitamin C	0	0	6172	6172
Zinc	805	805	467	467

No matter how much water is baked out of the sirloin or added to the soup, the nutrient values remain the same. Clearly spinach is a more nutritious food than sirloin except for vitamin B_{12}, which is zero. So also is the cholesterol content.

Now, there are stretch receptors in the stomach (that has a capacity of about one liter) to signal satiety by detecting volume. In order to fulfill the day's requirements of about 2400 Calories, one could easily consume 2.85 pounds of sirloin (1.29 liters) and still be short on calcium, fiber, folate, and vitamins A, C, and E. The chemoreceptors would be advising further food consumption to make up the shortfalls and the stomach would be reporting plenty of room, but one would already be at 376% of a *maximum* RDA (300 mg) for cholesterol (at 1128 mg) and close to 30% of Calories from fat.

Or one could take a stab at 2400 Calories of spinach for the day's food intake which would be 22 pounds or 9.3 liters. From personal experience I can say this is an experiment you won't want to try. The limiting nutrients (save vitamin B_{12} which is a given) are zinc and protein which are respectively at about 467and 400 "percent of (RDA per Calorie)." If one ate about 1/4 of the 22 pounds (5.5#, or 2.32 liters) over the course of

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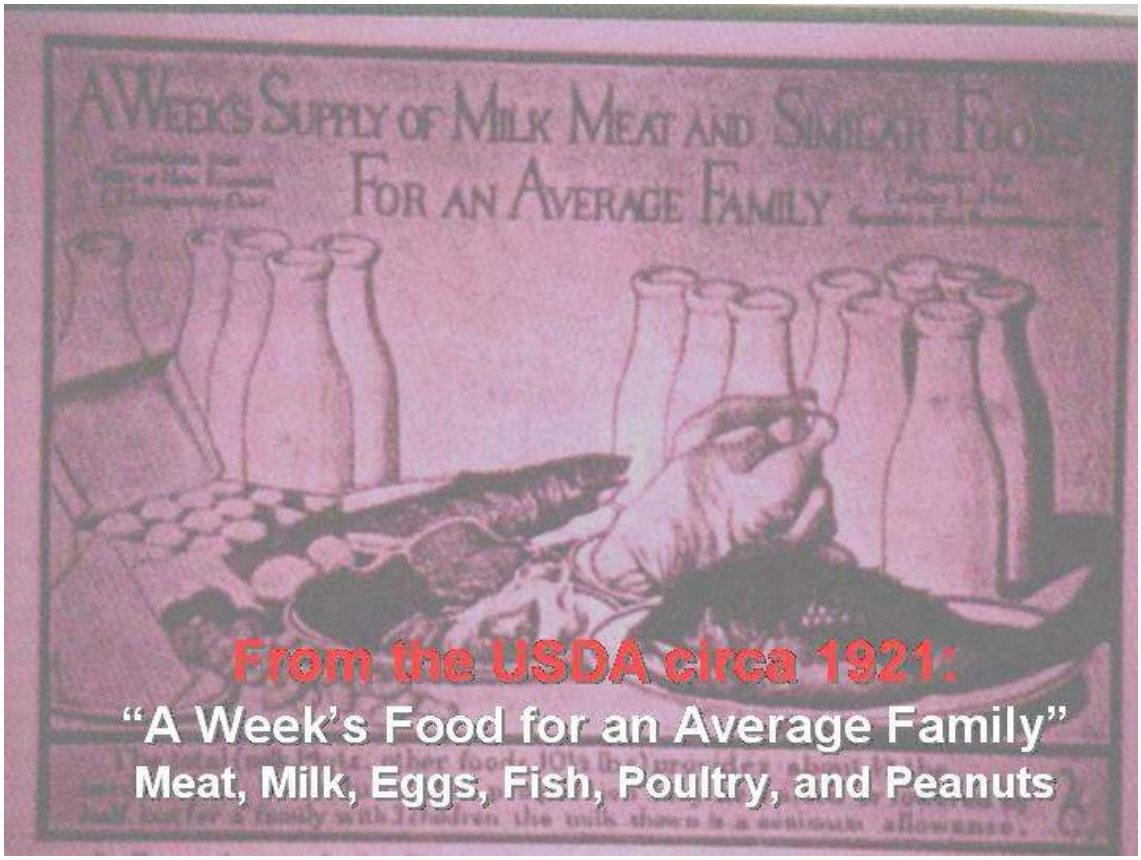
[11] See note 281. *Nutritionist IV. v2.0*. Salem OR, 1992.

two meals, one would still meet RDAs for all nutrients with a full stomach, but with a shortage of 3/4 the day's Calorie requirements. The Calorie shortage would then be taken out of the fat stores which may explain why vegans are generally healthy though slender.

On the other hand, nutrients, not Calories and not fat, are the limiters for those who follow the "Basic Four." Obesity is with us always, in part because of mathematically flawed nutritional advice.

In proper nutritional analysis the weight of food is irrelevant. But your body has an intuitive understanding of Calories and will demand that you eat enough of them. Most people can count on the fingers of one finger the number of U.S. citizens they've seen recently who looked as if they didn't meet their Calorie requirements. If each food and each Calorie meets 100% or more of the RDA per Calorie for each nutrient, your nutritional status is automatically assured, and you're probably eating mostly vegetables, not much fat, and no cholesterol.

Food grouping started out innocently enough in 1897 when W.O. Atwater, in *Food and Diet Yearbook of the USDA*,[12] tried to advise Americans how to make the best of their traditional meat-based diets. Over the years there have been two dozen food group schemes[13,14] listing anywhere from 3 to 11 "Basic Food Groups."



A ten group scheme in 1941 included water as a food group; many others have listed fat and sugar. Since then there have been another half dozen food group schemes, all financed by animal food interests and backed by

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[12]Hertzler, Anna and Anderson, Helen. *Food Guides in the United States.* J. Am. Diet. Ass'n. 1974;64:19-28.

[13]Haughton, Gussow, and Dodds. *An Historical Study of the Underlying Assumptions for United States Food Guides from 1917 Through the Basic Four Food Group Guide.* Society for Nutrition Education. Vol. 19 No.4 July/August 1987.

[14]Hill, Mary and Cleveland, Linda. *Food Guides-Their Development and Use*. Nutrition Program News U.S Department of Agriculture. Washington D.C. July-October 1970.

respected nutritionists[15] who, in other ways diverse, all failed to let on that sorting foods by nutrient/weight ratio is fundamentally unsound.

Does it matter? The "Basic Four" poster on page one, that says "National Dairy Council" on the back in small print, was obtained from a hospital dietician who keeps sheaves of them on hand for patient education. A trip to the State Health Department produced an assortment of 4,5, and 9 food group posters. Two required school of nutrition textbooks at the local university include the "Basic Four,"[16] one with a five page color spread.[17]

In recent years there has been mention of "Nutrient Density" which is nutrient/Calorie analysis with RDAs installed in both numerator and denominator.[18] A few authors[19,20] have utilized this powerful antidote to food industry flim-flam. "The recommendation that nutrient labelling be provided in relation to Calories has obvious merit," in the words[21] of Mark Hegsted, M.D.

But suggesting nutrient/Calorie analysis to the food industry produces much the same effect as approaching Dracula with a white stake since when Nutrient Density flies in one window, the animal foods fly out the other, taking with them most of the fat and sugar bon-bons as well. The "Basic Four" materialize only if foods are sorted by nutrient/weight ratio which is an ideal strategy to sell animal food, which is a great way to keep excess Calories, cholesterol and saturated fat in the diet, which is a splendid way to grow an arteriosclerotic, obese, cancer-ridden nation, which is what we have.

Sorting and preferencing foods by nutrient/weight ratio is Home Economics 101, not science.

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[15]Hausman, Patricia.*Jack Sprats Legacy. The Science and Politics of Fat & Cholesterol*. Center for Science in the Public Interest. New York,1981

[16]Obert, Craig. *Community Nutrition*. John Wiley & Sons. New York, 1978.ISBN 0-471-65236-9.

[17]Christian, Janet L. and Greger, Janet L. *Nutrition for Living.* Benjamin Cummings, Inc. Menlo Park 1988.ISBN 0-8053-2006-7.

[18]Hanson, Wyse, and Sorenson. *Nutritional Quality Index of Foods.* AVI Publishing Co. Westport, 1979. ISBN 0-87055-320-8.

[19]Akers, Keith. *A Vegetarian Sourcebook.* G.P Putnam. New York, 1983. ISBN 0-399-12802-6.

[20]McDougall, John A. and McDougall, Mary A. *The McDougall Plan.* pp.322-328. New Century 1983. ISBN 0-8329-0289-6.

[21]See note 108. Hegsted p 41.