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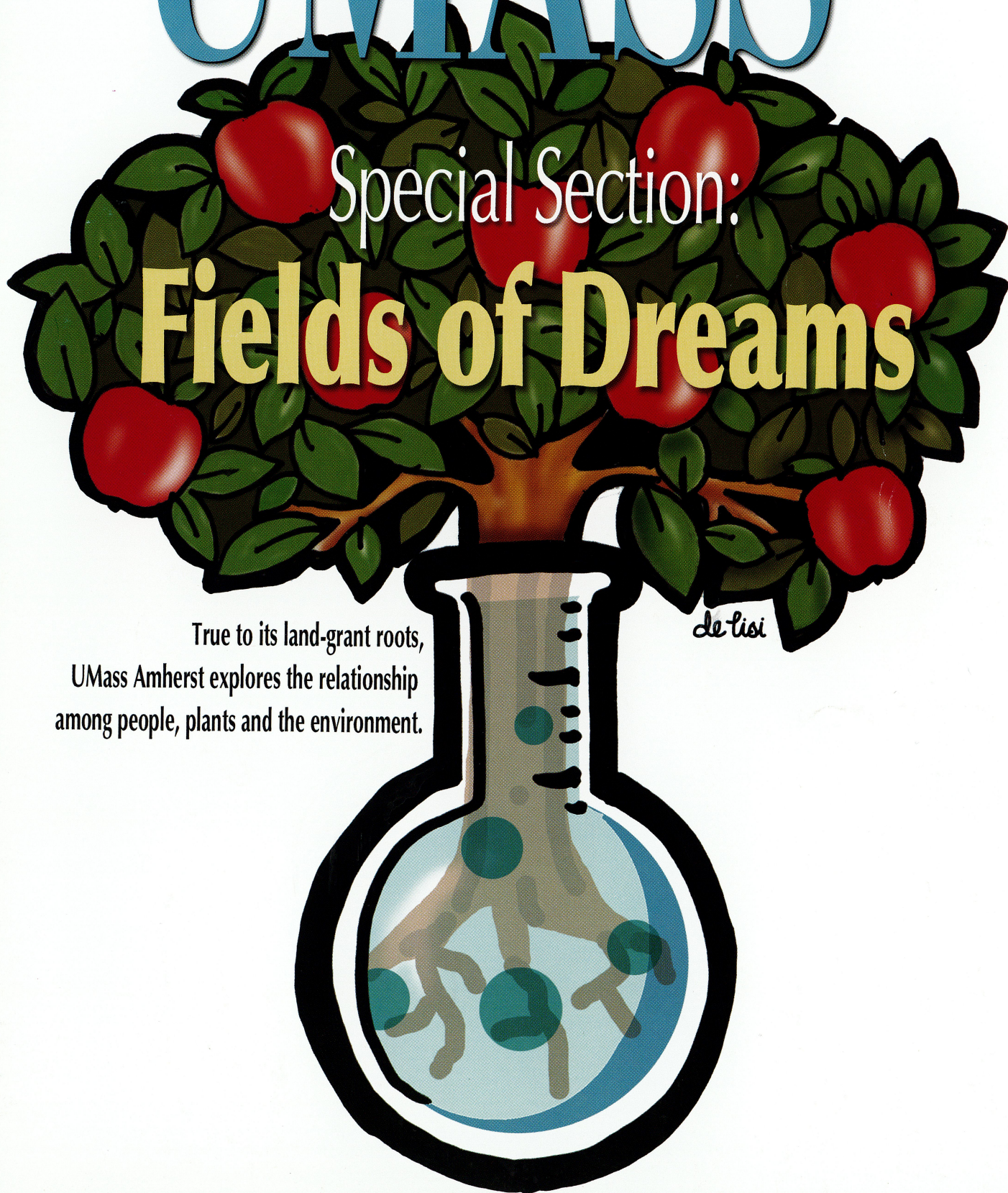
UMASS *Amherst*

Special Section:

Fields of Dreams

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UMass Amherst explores the relationship
among people, plants and the environment.

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A Spoonful of Sugar

Dietary guidelines are smarter (and sweeter) thanks to the lifework of Fergus Clydesdale.

By Carol Cambo

When the waitress takes his lunch order, he chooses a cup of black tea and a smoked turkey sandwich on whole wheat bread. When it arrives, he chews slowly, conversing animatedly between bites. Fergus Clydesdale '66G is wiry and strong, true to his Scottish Canadian lineage. Between talking points, he dunks corn chips in salsa. At nearby tables in the University Club, faculty and administrators lean over bowls of chowder and plates of pasta. The waitress clears his dish and most of his corn chips have been left untouched.

I thought he'd be more rigid, a salad-eater at least, an obsessive hand-washer, or just somehow more picky about food in general. I thought twice about what to order for lunch in his presence. He is, after all, an icon in his profession, head of the Department of Food Science at UMass Amherst, one of the most distinguished of its kind in the country. And he just completed a yearlong stint—which he half-jokingly calls a jail sentence—on the committee to revise the Dietary Guidelines for Americans published by the federal government.

The lunch date confirmed that Clydesdale ("Ferg," as he is known to many) is not unnaturally obsessed with his own diet. Even when I pump his son, John, who is head cook at Franklin Dining Commons, for information ("Were you force-fed gruel as a child? Did you have any choice *but* to go into the food profession?"), he doesn't appear to be hiding anything when he tells me, over his daily dish of ice cream, "No, he was just a regular dad, but we share a mean sweet tooth."

His father—beloved professor, tireless researcher, food-policy wonk—claims a body of work the sheer size of which could fill a walk-in freezer. He understands food on the molecular level, in more mind-boggling detail than most of us care to know, yet knows, that ultimately food must taste good and look good for us to eat it.

Fergus Clydesdale is a quick wit who practices the healthy balance he preaches: eat a little bit of everything. Enjoy it. Get some exercise. For Clydesdale this balance translates into a standing Tuesday-night dessert date with John (the sweeter and gooey, the better) and jogging a few miles every other day. Yes, everything in moderation, including the M&Ms in a dish on his office desk. "They're peanut—protein!" he explains.

He is a man comfortable with making fun of himself, whose estimable rise to the top of the food chain, so to speak, began when he was asked by the revered late UMass Amherst professor and fellow Canadian Jack Francis if he might come study here. "More schooling sounded better than the medical research job I had landed," says Clydesdale. "So I came." He has been here ever since. And every day he asks how to make it easier for us food-faddist, chronically obese Americans to eat for better living. It's a question he's been trying to answer since 1960.

Clydesdale's nine-page single-spaced resume traces the modern history of food science. His first major interest was in plant pigments such as chlorophyll and anthocyanins, the latter acting as antioxidants. Then he focused on mineral chemistry with a physiological bent. "I went to UCal Davis on sabbatical to get up to scratch on the literature, then came back and started a new research unit, which everyone said not to do," says Clydesdale of his early days. Back at UMass Amherst, he not only started a new unit, he zeroed in on a global problem: anemia, and the lack of iron in diets around the world.

"The problem is that iron isn't very available in fruits and vegetables. So, if you cut back on meats, you need to get it through fortified foods," he explains. But that wasn't so simple, because iron in early fortifying forms became insoluble in the intestine and couldn't be absorbed. "So we experimented with adding elemental iron—filings, really—to things like cereal. The food was truly magnetic," he says. His group also found a way to add iron to ascorbic acid to then spray it on foods; they experimented with binding iron to proteins so that it would release in the chemistry of the



According to food science professor Fergus Clydesdale, eating right is a constant juggling act.

intestine. In short, thinking outside the box, or more literally in this case, inside the cereal box.

His creative and thorough approaches won Clydesdale early renown, laying the foundation for his distinguished career. His teaching and research won honors and he became a sought-after consultant, board and panel member, and a globe-trotting teaching fellow and speaker on five continents. He has served on congressional panels investigating nutrition issues, secured millions of dollars in grants and corporate funding, been named an associate of the prestigious National Academy of Sciences, advised the FDA and USDA, and published scores of research papers and books. Food science is his life's work.

Clydesdale was asked to join the 2005 Dietary Guidelines for Americans committee, a who's who of food scientists. By decree, the USDA and Health and Human Services must publish updated guidelines every five years to incorporate the latest findings; the work on the 2005 edition began in late 2003. "There had been hints I might be asked," says Clydesdale. He was hesitant because he had just served on a time-consuming committee revising Daily Recommended Intakes (DRI) of various vitamins and minerals—the nutrition information found on food packaging. "But when the call finally came from the White House," he says, "I couldn't really refuse."

Thompson 104 is one of the older lecture halls on campus, with honey-colored paneling and dim lighting. On a sunny September day it's packed to overflowing with lowerclassmen fulfilling their science general-ed requirement with Food Science 101. Even as Clydesdale thanks the students for showing up ("As an undergrad, I can't say I would have made it to class on such a nice afternoon"), they text-message friends on their cell phones, read *The Collegian*, sleep off last night's party.

"This class is my baby," he tells them. "I wanted to call it 'science for poets.' That didn't make the cut. But what I want you to be able to do is read a magazine or newspaper with some intelligence. There is so much junk information out there. I can't make you a scientist in a semester, but I can get you to know what's going on in the world, and about health and exercise."

Clydesdale launches into a humorous monologue about nutrition and the basic functions of the digestive system. He interrupts himself with a caveat, "Oh, and if you smoke—and I used to—don't even worry about nutrition. Eat whatever you like, because smoking will kill you first."

Clydesdale sketches the esophagus and stomach on an overhead projector screen.

"And what's in the stomach?" he queries the students. "Acid, man!" he says, with a deliberate hippie twang that elicits chuckles. "If you stuck your fingers in there they'd come out with stubs!" He explains the function of the duodenum, or valve, at the top of the stomach that prevents acid from splashing up into the esophagus by describing how you feel after Thanksgiving dinner, when you've clearly eaten too much. "All those antacids and laxatives, all those heartburn ads, they tell me we're eating too much," he says.

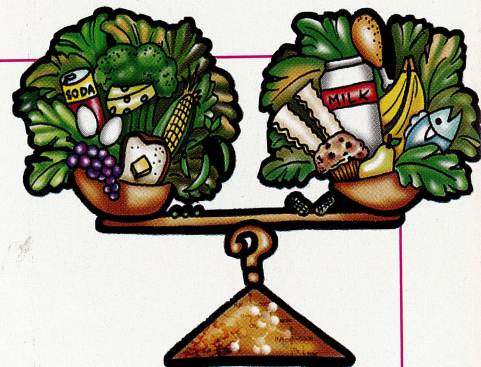
Next on Clydesdale's diagram is the ileum, or small intestine, at which point he whips out a 23-foot-long transparent tube the thickness of a finger. Standing on stage, he shakes it out to its full length and explains this is where enzymes break down food, so that its nutrients are absorbed by the blood and the muscles. He describes peristalsis—muscular contraction and relaxation that moves solids through the small intestine—as being "like the wave at football stadiums. When you only eat refined foods, you might wonder why you haven't been to the bathroom in four days," says Clydesdale. He explains that the system needs fiber and whole grains to work properly, "so it all goes smoothly." The students are paying attention now, perked up by the bathroom humor, as he professes that the way to avoid hemorrhoids and laxatives is to eat right.

He mentions in passing that he just finished up on the Dietary Guidelines committee, but it's doubtful many of the students catch the significance, or even know the caliber of the scientist who stands before them demystifying constipation.

Sample Questions

Food Science 101 midterm exam

1. The homeostatic mechanism for blood sugar is mainly controlled by:
a) diet b) insulin c) glucagons d) a&b e) b&c
2. Non-essential amino acids are:
a) obtained only from the diet
b) obtained from the diet and can be made in the body from other amino acids
c) can only be made in the body from other amino acids and NOT obtained from the diet
d) all of the above
3. Mitochondria are responsible for the conversion of macronutrients into:
a) protein b) carbohydrate c) energy d) fat e) enzymes
4. The most toxic vitamin is:
a) vitamin C b) Vitamin E c) vitamin D d) any of the B vitamins
5. Proteins function
a) to provide body structure (muscles, hair, teeth), regulate body functions (enzymes, hormones), and add flavor, stability, and thickening properties to foods.
b) as a main source of energy for the body
c) as the only nutrient source for fat storage
d) solely to increase vitamin absorption



Answers: 1. e; 2. b; 3. c; 4. c; 5. a.

But he doesn't teach Food Science 101 in quest of fame. He's here for the same reason he was drawn to the field in the first place: "Because I could do something that could have an impact right away." In a rare sober voice, Clydesdale tells the students that the nutrition and exercise habits they establish now will affect their quality of life in the long run.

At the end of class, Clydesdale shares an anecdote from his Guidelines work. "I became somewhat famous for a quote I used to introduce the topic," he says. "'Safe food is a little bit like safe sex: everyone knows about it, but nobody does it.'"

Smart eating, it seems, is a lot like safe sex too.

would be two-step process: First, a committee would determine the most important nutrition-related public health issues. Second, officials would devise communications strategies to educate the public and change behavior. This approach signaled a change in philosophy. The government was no longer simply aiming to inform; now it sought to persuade—to coach us to make smarter choices when we stand in front of the fridge and wonder what's for dinner.

When the 13-member 2005 Guidelines committee reported for duty, "we were asked to review scientific data differently than in the past, to weight studies according to design, quality, scope, and focus, rather than consider them all equal," says Clydesdale.

As well, the work of the committee would provide the basis

"Safe food is a little bit like safe sex: everyone knows about it, but nobody does it."

—Food Science Professor Fergus Clydesdale '66G

Like Food Science 101, the Dietary Guidelines boil down hard science to concise messages that will ultimately arm us—be we sleepy freshmen or overweight adults—with the information to live healthier lives.

The U.S. government has been in the business of telling Americans what to eat since 1894, before specific vitamins and minerals had yet been discovered. The current guidelines, which guide federal food policy, evolved from a Farmer's Bulletin by W.O. Atwater, the first director of the Office of Experiment Stations in USDA. He wrote that "the evils of overeating may not be felt at once, but sooner or later they are sure to appear—perhaps in an excessive amount of fatty tissue, perhaps in general debility, perhaps in actual disease."

Atwater was on to something. The gist of the initial key message has held true for over a century: eat a variety of foods in moderation and in reasonable portions. The science, methodology, and philosophy of the guidelines, however, have changed.

For much of the first half of the 20th century, the government focused on categorizing foods and helping people eat right during financial hard times such as the Great Depression. By the 1970s, there was marked emphasis on the emerging connection between certain food components—fat, saturated fat, cholesterol, and sodium—and the risk of chronic diseases. The first Dietary Guidelines for Americans were published in 1980. Soon after, the first graphic tool, in the shape of a wheel, appeared in 1984. The pyramid replaced it in 1992.

In 1995, the government decided that Guidelines revision

for revising or possibly scrapping the pyramid. Since 1992, the pyramid has come under deserved attack as an ineffective and at times misleading tool for good nutrition, a result, no doubt, of condensing reams of guidelines into a single graphic representation. Early in 2005 the government unveils its new campaign, and a graphic system to be used in food labeling. With the help of a high-profile public relations firm, it hopes to do a better job of persuading Americans to eat healthier.

When the yearlong round of public meetings and review of studies began, Clydesdale was named chair of the food safety subcommittee and served on energy and carbohydrates. "At one point, on a conference call, there was a disagreement about sugar in beverages," recalls Clydesdale, illuminating the painstaking process. "Do sugared beverages create less satiety than solids, thus causing people to make up calories at meals?" Clydesdale didn't believe the evidence supported such a conclusion at the time. "But I had to review 62 papers to make my point."

Last August, the committee published the 2005 Guidelines, a document of over 500 pages, covering such topics as the proper amount of time to wash one's hands (20 seconds, or the time it takes to hum a little tune) to a new standard for exercise (most Americans should get one hour of daily exercise), each point bolstered by recent studies. As in years past, the information is boiled down to seven to 10 key messages. The new process of weighting data resulted in a few surprises.

The most significant point of departure from the 2000 Guidelines: the committee removed the "moderate your

Trees We Love



Red "Century" Oak

Quercus borealis

Quercus, an ancient Latin name, is likely of Celtic origin, meaning "beautiful tree." *Borealis* identifies it as "of the north." The red-hued wood of this, the fastest growing oak, is often used in flooring in homes. This is the 1900 Class Tree, hence its designation as Century Oak.

For a complete list of trees and locator map visit
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Black Walnut

Juglans nigra

Widely harvested because of its fine wood (and for that reason, rather rare), *Juglans*, a contraction of *Jovis glans*, designates the nut or acorn of Jupiter, king of the gods. *Nigra* may refer to the black bark, the rich brown wood, or the dark outer shell of the nut. Everything on this tree is used; its fruit is a valuable food source for animals. This Class of 1894 tree is an excellent specimen.

For a complete list of trees and locator map visit
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intake of sugars" recommendation. The report is concerned less with sugar itself than with a tendency for Americans who eat added-sugar foods to get shortchanged on nutrients.

"The evidence on sugars contributing to obesity is not tremendously strong," said Clydesdale. Instead, the committee endorsed the idea of "discretionary calories," those from added sugars and solid fats that are fine to eat once basic nutritional needs have been fulfilled.

"Oh, I have a terrible sweet tooth," admits Clydesdale. "But I don't have a fat tooth. They are different, and studies show that weight gain seems to be less with a sweet tooth than with a fat tooth." His favorite dessert is a Canadian butter tart which he jokingly fights over with his daughter when she visits from Seattle; its closest relative in the U.S. is pecan pie, "but it's not really that close," he says. The point is, says Clydesdale, it's not about whether sugar is good or bad; it's about people using food wisely to get necessary nutrients. "We're not coming down against anything, so if someone does enough exercise and wants to have a soda or a candy bar, that's fine," Clydesdale told MSNBC.com when the guidelines were first released.

Despite the public's recent love affair with low-carb diets, the committee didn't support them either, calling instead for people to "choose carbohydrates wisely," recommending whole foods over processed foods. The biggest health problem facing Americans, says Clydesdale, is obesity. "And the message is clear: Take in fewer calories. Obesity is huge problem. You can't flout the first law of thermodynamics. If you put more in and don't use it, you'll get bigger."

Yet obesity is a complex syndrome, one we don't completely understand. "We are working on it. It's a combination of science and social science. It's not just about lack of willpower," says Clydesdale, citing the 95-percent failure rate for keeping off lost weight. "We're beginning to understand more about what affects satiety. Perhaps we can help people trigger fullness. We're starting to look at it on a molecular level. Hormones have something to do with it, but do we have different sensitivities to taste? Food may do for some more than it does for others."

When Clydesdale began his career, the biggest problem used to be getting enough food. "Now we have too much food, and it tastes too good." We are genetically programmed to eat as much as we can and rest whenever we have the chance, he says. This is the first time in history that most people can eat as much as they want. "We were too successful in increasing food production, if that's possible," he says. "Our science moved faster than the evolutionary process." So, four decades later, the challenge has changed but Fergus Clydesdale's aim has not: he's still bringing the best science to bear on the world's food dilemmas.

