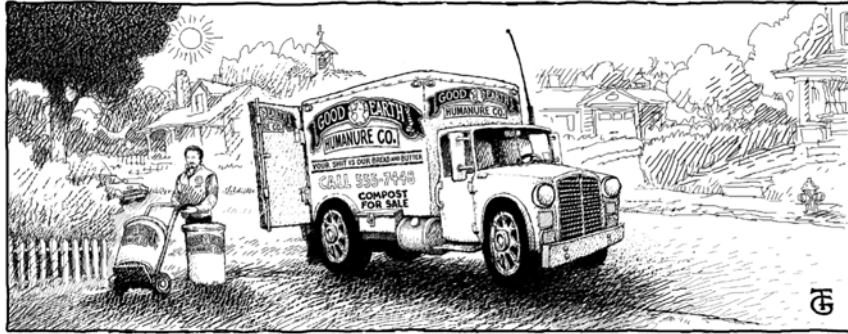


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## THE END IS NEAR

**L**adies and gentlemen, allow me to introduce you to a new and revolutionary literary device known as the *self-interview*! (Applause heard in background. Someone whoops.) Today I'll be interviewing myself. In fact, here I am now. (Myself walks in.)

*Me: Good morning, sir. Haven't I seen you somewhere before?*

*Myself: Cut the crap. It's too early in the morning for this. You see me every time you look in the mirror, which isn't very often, thank God. What, for crying out loud, would possess you to interview yourself, anyway?*

*M: If I don't, who will?*

*MS: You do have a point there. In fact, that may be an issue worthy of contemplation.*

*M: Well, let's not get off the track. The topic of discussion today is a substance near and dear to us all. Shall we step right into it?*

*MS: What the hell are you talking about?*

*M: I'll give you a hint. It often can be seen with corn or peanuts on its back.*

*MS: Elephants?*

*M: Close, but no cigar. Actually, cigar would have been a better guess. We're going to talk about humanure.*

*MS: You dragged me out of bed and forced me to sit here in front of all these people to talk about CRAP?!*

*M: You wrote a book on it, didn't you?*

*MS: So what? OK, OK. Let's get on with it. I've had enough of*

your theatrics.

*M: Well, first off, do you expect anyone to take the Humanure Handbook seriously?*

**MS:** Why wouldn't they?

*M: Because nobody gives a damn about humanure. The last thing anyone wants to think about is a turd, especially their own. Don't you think that by bringing the subject to the fore you're risking something?*

**MS:** You mean like mass constipation? Not quite. I'm not going to put any toilet bowl manufacturers out of business. I'd estimate that one in a million people have any interest at all in the topic of resource recovery in relation to human excrement. Nobody thinks of human manure as a resource; the concept is just too bizarre.

*M: Then what's the point?*

**MS:** The point is that long-standing cultural prejudices and phobias need to be challenged once in a while by somebody, anybody, or they'll never change. Fecophobia is a deeply rooted fear in the American, and perhaps even *human*, psyche. But you can't run from what scares you. It just pops up somewhere else where you least expect it. We've adopted the policy of defecating in our drinking water and then piping it off somewhere to let someone else deal with it. So now we're finding our drinking water sources dwindling *and* becoming increasingly contaminated. What goes around comes around.

*M: Oh, come on. I drink water every day and it's never contaminated. We Americans probably have the most abundant supply of safe drinking water of any country on the planet.*

**MS:** Yes and no. True, your water may not suffer from fecal contamination, meaning intestinal bacteria in water. But how much chlorine do you drink instead? Then there's water pollution from sewage in general, such as beach pollution. But I don't want to get into all this again. I've already discussed human waste pollution in Chapter Two.

*M: Then you'll admit that American drinking water supplies are pretty safe?*

**MS:** From disease-causing microorganisms, generally yes, they are. Even though we defecate in our water, we go to great lengths and expense to clean the pollutants out of it. The chemical additives in our water, such as chlorine, on the other hand, are not good to drink. And let's not forget that drinking-water supplies are dwindling all over the world, water tables are sinking, and water consumption is on the increase with no end in sight. That seems to be a good reason not to pollute water with our daily bowel movements. Yet, that's only *half*

the equation.

*M: What do you mean?*

MS: Well, we're still throwing away the agricultural resources that humanure could be providing us. We're not maintaining an intact human nutrient cycle. By piping sewage into the sea, we're essentially dumping grain into the sea. By burying sludge, we're burying a source of food. That's a cultural practice that should be challenged. It's a practice that's not going to change overnight, but will change incrementally if we begin acknowledging it now.

*M: So what're you saying? You think everybody should shit in a five-gallon bucket?*

MS: God forbid. Then you *would* see mass constipation!

*M: Well then, I don't understand. Where do we go from here?*

MS: I'm not suggesting we have a mass cultural change in toilet habits. I'm suggesting that, for starters, we need to change the way we *understand* our habits. Most people have never heard of such a thing as a nutrient cycle. Many people don't even know about compost. Recycling humanure is just not something people think about. I'm simply suggesting that we begin considering new approaches to the age-old problem of what to do with human excrement. We also need to start thinking a bit more about how we live on this planet, because our survival as a species depends on our relationship with the Earth.

*M: That's a beginning, but that's probably all we'll ever see in our lifetime, don't you think? Some people, like you for example, will think about these things, maybe write about them, maybe even give them some lip service. Most people, on the other hand, would rather have a bag of cheese puffs in one hand, a beer in the other, and a TV in front of them.*

MS: Don't be so sure about that. Things are changing. There are more than a few people who will turn off their TVs, pick the orange crumbs out of their teeth, and get busy making the world a better place. I predict, for example, that composting toilets and toilet systems will continue to be designed and redesigned in our lifetimes. Eventually, entire housing developments or entire communities will utilize composting toilet systems. Some municipalities will eventually install composting toilets in all new homes.

*M: You think so? What would that be like?*

MS: Well, each home would have a removable container made of recycled plastic that would act as both a toilet receptacle and a garbage disposal.

*M: How big a container?*

MS: You'd need about five gallons of capacity per person per week. A container the size of a 50-gallon drum would be full in about

two weeks for an average family. Every household would deposit all of its organic material except graywater into this receptacle, including maybe some grass clippings and yard leaves. The municipality could provide a cover material for odor prevention, consisting of ground leaves, rotted sawdust, or ground newsprint, neatly packaged for each household and possibly dispensed automatically into the toilet after each use. *This would eliminate the production of all organic garbage and all sewage*, as it would all be collected without water and composted at a municipal compost yard.

*M: Who'd collect it?*

**MS:** Once every couple of weeks or so, your municipality or a business under contract with your municipality would take the compost receptacle from your house. A new compost receptacle would then replace the old. This is already being done in the entire province of Nova Scotia, Canada, and in areas of Europe where organic kitchen materials are collected and composted.

When toilet material is added to the collection system, your manure, urine and garbage, mixed together with ground leaves and other organic refuse or crop residues, would be collected regularly, just like your garbage is collected now. Except the destination would not be a landfill, it'd be the compost yard where the organic material would be converted, through thermophilic composting, into an agricultural resource and sold to farmers, gardeners, and landscapers who'd use it to grow things. The natural cycle would be complete, immense amounts of landfill space would be saved, a valuable resource would be recovered, pollution would be drastically reduced, if not prevented, and soil fertility would be enhanced. So would our long-term survival as human beings on this planet.

*M: I don't know . . . how long before people will be ready for that?*

**MS:** In Japan today, a similar system is in use, except that rather than removing the container and replacing it with a clean one, the truck that comes for the humanure sucks it out of a holding tank. Sort of like a truck sucking the contents out of a septic tank.

Such a truck system involves a capital outlay about a third of that for sewers. One study which compares the cost between manual humanure removal and waterborne sewage in Taiwan estimates manual collection costs to be less than one-fifth the cost of waterborne sewage treated by oxidation ponds. That takes into account the pasteurization of the humanure, as well as the market value of the resultant compost.<sup>1</sup>

*M: But that's in the Far East. We don't do stuff like that in America.*

**MS:** One of the most progressive large scale examples I have

seen is in Nova Scotia, Canada. On November 30, 1998, Nova Scotia banned all organic material from entering its landfills. The Province provides free receptacles for every household to deposit their food scraps into. So when a banana peel or burnt pop-tart gets pitched into the trash, it goes into the *green cart* along with egg shells, coffee grounds, and even cereal boxes, waxed paper and file folders. Then, every two weeks, a truck comes around, just like the standard garbage trucks we're used to seeing, and picks up the organic material. From there, it goes to one of many central composting yards, where the material gets run through a grinder and shoved into a giant composting bin. Within 24 to 48 hours, the thermophilic microorganisms in the garbage have raised the temperature of the organic mass to 60-70°C (140-158°F). And it's a totally natural process.

The Netherlands was one of the first countries to mandate large scale source separation of organic material for composting, having done so since 1994; in at least five European countries, such separation is common.<sup>2</sup> Since 1993, in Germany, for example, discarded waste material must contain less than 5% organic matter, otherwise the material has to be recycled, mainly by composting.<sup>3</sup> In England and Wales, a target has been set to compost a million tonnes of organic household material by the year 2000.<sup>4</sup>

*M: But those are not toilets.*

**MS:** Can't you see? This is only one small step away from collecting toilet materials and composting them, too. Toilets will be redesigned as *collection* devices, not *disposal* devices. We've developed the art, science and technology of composting enough to be able to constructively recycle our own excrement on a large scale.

*M: So why don't we?*

**MS:** Because humanure doesn't exist, as far as most compost professionals are concerned. It's not even on the radar screen. Human manure is seen as human *waste*, something to be disposed of, not recycled. When I was visiting composting operations in Nova Scotia, one compost educator told me there were 275,000 metric tonnes of animal manures produced annually in his county suitable for composting. He did not include human manure in his assessment. As far as he was concerned, humans are not animals and they don't produce manure.

To give you an example of how clueless Americans are about composting humanure, let me tell you about some missionaries in Central America.

*M: Missionaries?*

**MS:** That's right. A group of missionaries was visiting an

indigenous group in El Salvador and they were appalled by the lack of sanitation. There were no flush toilets anywhere. The available toilet facilities were crude, smelly, fly-infested pit latrines. When the group returned to the United States, they were very concerned about the toilet problem they had seen and decided they should help. But they didn't know what to do. So they shipped a dozen portable toilets down there, at great expense.

*M: Portable toilets?*

**MS:** Yeah, you know, those big, plastic outhouses you see at rest stops along the highways, at construction sites and festivals. The ones that smell bad, and are filled with a blue liquid choked with floating turds and toilet paper.

*M: Oh yeah.*

**MS:** Well, the village in El Salvador got the portable toilets and the people there set them up. They even used them — until they filled up. The following year, the missionaries visited the village again to see how their new toilets were working.

*M: And?*

**MS:** And nothing. The toilets had filled up and the villagers stopped using them. They went back to their pit latrines. They had a dozen portable toilets sitting there filled to the brim with urine and crap, stinking to high heaven, and a fly heaven at that. The missionaries hadn't thought about what to do with the toilets when they were full. In the U.S., they're pumped out and the contents are taken to a sewage plant. In El Salvador, they were simply abandoned.

*M: So what's your point?*

**MS:** The point is that we don't have a clue about constructively recycling humanure. Most people in the U.S. have never even had to think about it, let alone do it. If the missionaries had known about composting, they may have been able to help the destitute people in Central America in a meaningful and sustainable way. But they had no idea that human manure is as recyclable as cow manure.

*M: Let me get this straight. Now you're saying that humans are the same as cows?*

**MS:** Well, all animals defecate. Many westerners simply won't admit it. But we're starting to. We Americans have a long way to go. The biggest obstacle is in understanding and accepting humanure and other organic materials as resource materials rather than waste materials. We have to stop thinking of human excrement and organic refuse as waste. When we do, then we'll stop defecating in our drinking water and stop sending our garbage to landfills.

It's critical that we separate water from humanure. As long as

we keep defecating in water we'll have a problem that we can't solve. The solution is to stop fouling our water, not to find new ways to clean it up. Don't use water as a vehicle for transporting human excrement or other waste. Humanure must be collected and composted along with other solid (and liquid) organic material produced by human beings. We won't be able to do this as long as we insist upon defecating into water. Granted, we can dehydrate the waterborne sewage sludge and compost that. However, this is a complicated, expensive, energy-intensive process. Furthermore, the sludge can be contaminated with all sorts of bad stuff from our sewers which can become concentrated in the compost.<sup>5</sup>

*M: Composting sewage sludge is bad?*

**MS:** No. In fact, composting is probably the best thing you can do with sludge. It's certainly a step in the right direction. There are many sludge composting operations around the world, and when the sludge is composted, it makes a useful soil additive. I've visited sludge composting sites in Nova Scotia, Pennsylvania, Ohio, and Montana, and the finished compost at all of the sites is quite impressive.

*M: It'll never happen (shaking his head). Face it. Americans, Westerners, will never stop shitting in water. They'll never, as a society, compost their manure. It's unrealistic. It's against our cultural upbringing. We're a society of hotdogs, hairspray and Ho-Hos, not composted humanure, fer chrissake. We don't believe in balancing human nutrient cycles! We just don't give a damn. Compost making is unglamorous and you can't get rich doing it. So why bother?!*

**MS:** You're right on one point — Americans will never stop shitting. But don't be so hasty. In 1988, in the United States alone, there were only 49 operating municipal sludge composting facilities.<sup>6</sup> By 1997, there were over 200.<sup>7</sup> The U.S. composting industry grew from less than 1,000 facilities in 1988 to nearly 3,800 in 2000 and that number will only increase.<sup>8</sup>

In Duisberg, Germany, a decades-old plant composts 100 tons of domestic refuse daily. Another plant at Bad Kreuznach handles twice that amount. Many European composting plants compost a mixture of refuse and sewage sludge. There are at least three composting plants in Egypt. In Munich, a scheme was being developed in 1990 to provide 40,000 households with "biobins" for the collection of compostable refuse.<sup>9</sup>

It's only a matter of time before the biobin concept is advanced to collect humanure as well. In fact, some composting toilets already are designed so that the humanure can be wheeled away and com-



Butler, Pennsylvania, U.S., sewage sludge composting facility (above).

Missoula, Montana, sewage sludge, after composting, is bagged and sold for home gardens (below).

A Nova Scotian compost operator inspects the windrow sewage sludge composting operation (bottom).

All photos by author.





posted at a separate site. Eventually, municipalities will assume the responsibility for collecting and composting all organic material from urban and suburban human populations, including toilet materials.

*M: Yeah, right.*

**MS:** And you are now revealing the main obstacle toward a sustainable society. Personal attitude. Everything we take for granted today — shoes, clothing, metal tools, electronic equipment, heck, even toilet paper, exists for one reason, and one reason only: because someone in the past cared about the future. You'd be running around naked today chasing rabbits with a stick if people in the past hadn't made things better for us in the present. We all have an obligation to our future generations. That's what evolution is and that's what survival of the species requires. We have to think ahead. We have to care about our descendants too, and not just about ourselves. That means we have to understand that waste is not good for us, or for future generations. When we dump endless amounts of garbage into the environment with the attitude that someone in the future can deal with it, we are not evolving, we're *devolving*.

*M: What's that supposed to mean?*

**MS:** It's simple enough. OK, you have trash. You don't throw the trash "out." There is no "out." It has to go somewhere. So you simply sort the trash into separate receptacles in your home, and that makes it easy to recycle the stuff. When it's recycled, it's not wasted. A chimpanzee could figure that out. It's easy to understand and it's easy to do.

A lot of compost that's been produced by big composting plants has been contaminated with things like batteries, metal shards, bottle caps, paints and heavy metals. As a result, much of it hasn't been useful for agriculture. Instead, it's been used for filler or for other non-agricultural applications, which, to me, is absurd. The way to keep junk out of compost is to value compostable material enough to collect it separately from other trash. A household biobin would do the trick. The biobin could be collected regularly, emptied, its contents composted, and the compost sold to farmers and gardeners as a financially self-supporting service provided by independent businesses.

The trick to successful large-scale compost production can be summed up in two words: *source separation*. The organic material must be separated at the source. This means that individual families will have to take some responsibility for the organic material they discard. They will no longer be permitted to throw it all in one garbage can with their plastic Ho-Ho wrappers, pop bottles, broken cell

phones and worn out toaster ovens. Organic material is too valuable to be wasted. The people in Nova Scotia have figured that out, as have many others throughout the world. Americans are a little slow.

*M: But they're not composting toilet materials, are they?*

**MS:** Some are composting sewage sludge, which is a big step in the right direction. Some entrepreneurs are in the sewage composting business in the United States, too. In 1989, the town of Fairfield, Connecticut, contracted to have its yard material and sewage sludge composted. The town is said to have saved at least \$100,000 in waste disposal costs in its first year of composting alone. The Fairfield operation is just a quarter mile from half million dollar homes and is reported to smell no worse than wet leaves from only a few yards away.<sup>10</sup> The EPA estimates that Americans will be producing 8.2 million tons of *biosolids* — that's another name for sewage sludge — by 2010 and that 70% of it will be recycled. Ironically, they only predict that 7% of that recycled sludge will be composted. Maybe the EPA will wake up before then and *smell the biosolids*.<sup>11</sup>

In Missoula, Montana, all of the city's sewage sludge is composted and the entire composting operation is funded by the tipping fees alone. All of the compost produced is pure profit and all of it is sold. Composting is a profitable venture when properly managed.

*M: But still, there's the fear of humanure and its capability of causing disease and harboring parasites.*

**MS:** That's right. But according to the literature, a biological temperature of 50°C (122°F) for a period of 24 hours is sufficient to kill the human pathogens potentially resident in humanure. EPA regulations require that a temperature of 55°C (131°F) be maintained for three days when composting sewage sludge in bins. Thermophilic microorganisms are everywhere, waiting to do what they do best — make compost. They're on grass, tree branches, leaves, banana peels, garbage and humanure. Creating thermophilic compost is not difficult or complicated and thermophilic composting is what we need to do in order to sanitize human excrement without excessive technology and energy consumption. Thermophilic composting is something humans all over the world can do whether or not they have money or technology.

There will always be people who will not be convinced that composted humanure is pathogen-free unless every tiny scrap of it is first analyzed in a laboratory, with negative results. On the other hand, there will always be people, like me, who conscientiously compost humanure by maintaining a well-managed compost pile, and who feel that their compost has been rendered hygienically safe as a result. A

layer of straw covering the finished compost pile, for example, will insulate the pile and help keep the outer surfaces from cooling prematurely. It's common sense, really. The true test comes in living with the composting system for long periods of time. I don't know anyone else who has done so, but after thirty years, I've found that the simple system I use works well for me. And I don't do anything special or go to any great lengths to make compost, other than the simple things I've outlined in this book.

Perhaps Gotaas hits the nail on the head when he says, "*The farm, the garden, or the small village compost operator usually will not be concerned with detailed tests other than those to confirm that the material is safe from a health standpoint, which will be judged from the temperature, and that it is satisfactory for the soil, which will be judged by appearance. The temperature of the compost can be checked by: a) digging into the stack and feeling the temperature of the material; b) feeling the temperature of a rod after insertion into the material; or c) using a thermometer. Digging into the stack will give an approximate idea of the temperature. The material should feel very hot to the hand and be too hot to permit holding the hand in the pile for very long. Steam should emerge from the pile when opened. A metal or wooden rod inserted two feet (0.5 m) into the pile for a period of 5-10 minutes for metal and 10-15 minutes for wood should be quite hot to the touch, in fact, too hot to hold. These temperature testing techniques are satisfactory for the smaller village and farm composting operations.*"<sup>12</sup>

In other words, humanure composting can remain a simple process, achievable by anyone. It does not need to be a complicated, high-tech, expensive process controlled and regulated by nervous people in white coats bending over a compost pile, shaking their heads and wringing their hands while making nerdy clucking noises.

I want to make it clear though, that I can't be responsible for what other people do with their compost. If some people who read this book go about composting humanure in an irresponsible manner, they could run into problems. My guess is the worst thing that could happen is they would end up with a mouldered compost pile instead of a thermophilic one. The remedy for that would be to let the mouldered pile age for a couple years before using it agriculturally, or to use it horticulturally instead.

I can't fault someone for being fecophobic and I believe that fecophobia lies at the root of most of the concerns about composting humanure. What fecophobes may not understand is that those of us who aren't fecophobes understand the human nutrient cycle and the importance of recycling organic materials. We recycle organic refuse because we know it's the right thing to do, and we aren't hampered by

irrational fears. We also make compost because we need it for fortifying our food-producing soil and we consequently exercise a high degree of responsibility when making the compost. It's for our own good.

Then, of course, there's the composter's challenge to fecophobes: *show us a better way to deal with human excrement.*

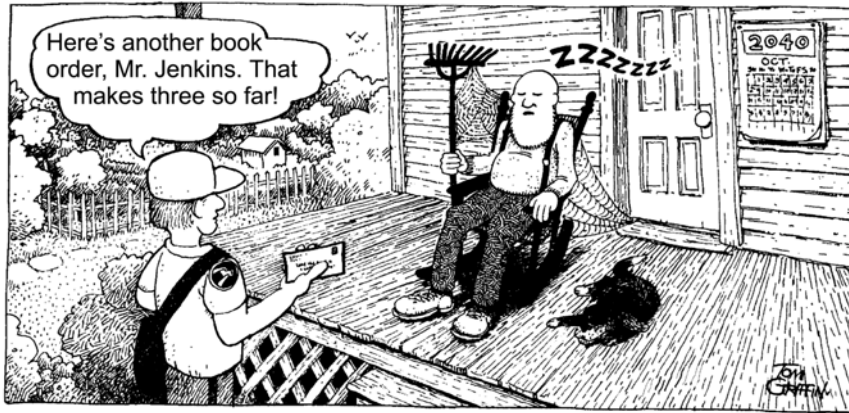
*M: Sounds to me like you have the final word on the topic of humanure.*

*MS: Hardly. The *Humanure Handbook* is only a tiny beginning in the dialogue about human nutrient recycling.*

*M: Well, sir, this is starting to get boring and our time is running out, so we'll have to wrap up this interview. Besides, I've heard enough talk about the world's most notorious "end" product. So let's focus a little on the end itself, which has now arrived.*

*MS: And this is it. This is the end?*

*M: "This is the end." (Sung like Jim Morrison.) What d'ya say folks?* (Wild applause, stamping of feet, frenzied whistling, audience jumping up and down, yanking at their hair, rolls of toilet paper are being thrown confetti-like through the air. Clothes are being torn off, people are cheering, screaming and foaming at the mouth. Someone starts chanting "Source separation, Source separation!" What's this!? The audience is charging the stage! The interviewee is being carried out over the heads of the crowd! Hot dang and hallelujah!)



### TEMPERATURE CONVERSIONS

E	C	F°	C°	C	E		
-40	.....	-40			0	.....	32.00°
-30	.....	-34.44			5	.....	41.00°
-20	.....	-28.88			10	.....	50.00°
-10	.....	-23.33			15	.....	59.00°
0	.....	-17.77			20	.....	68.00°
5	.....	-15.00			25	.....	77.00°
10	.....	-12.22			30	.....	86.00°
15	.....	-9.44			35	.....	95.00°
20	.....	-6.66			40	.....	104.00°
25	.....	-3.88			45	.....	113.00°
30	.....	-1.11			50	.....	122.00°
35	.....	1.66			55	.....	131.00°
40	.....	4.44			60	.....	140.00°
45	.....	7.22			65	.....	149.00°
50	.....	10.00			70	.....	158.00°
55	.....	12.77			75	.....	167.00°
60	.....	15.55			80	.....	176.00°
65	.....	18.33			85	.....	185.00°
70	.....	21.11			90	.....	194.00°
75	.....	23.88			95	.....	203.00°
80	.....	26.66			100	.....	212.00°
85	.....	29.44					
90	.....	32.22					
95	.....	35.00					
98.6	.....	36.99					
100	.....	37.77					
105	.....	40.55					
110	.....	43.33					
115	.....	46.11					
120	.....	48.88					
125	.....	51.66					
130	.....	54.44					
135	.....	57.22					
140	.....	60.00					
145	.....	62.77					
150	.....	65.55					
155	.....	68.33					
160	.....	71.11					
165	.....	73.88					

$$F^{\circ} = \frac{9}{5} C^{\circ} + 32$$

## THE HUMANURE HANDBOOK — GLOSSARY

- actinomycete** — Bacteria resembling fungi because they usually produce a characteristic, branched mycelium.
- activated sludge** — Sewage sludge that is treated by forcing air through it in order to activate the beneficial microbial populations resident in the sludge.
- aerobic** — Able to live, grow, or take place only where free oxygen is present, such as *aerobic* bacteria.
- algae** — Small aquatic plants.
- ambient air temperature** — The temperature of the surrounding air, such as the outdoor air temperature in the vicinity of a compost pile.
- amendment** — See “bulking agent.”
- anaerobic** — Able to live and grow where there is no oxygen.
- Ascaris** — A genus of roundworm parasitic to humans.
- Aspergillus fumigatus** — A spore-forming fungus that can cause allergic reactions in some people.
- bacteria** — One-celled microscopic organisms. Some are capable of causing disease in humans, others are capable of elevating the temperature of a pile of decomposing refuse sufficiently to destroy human pathogens.
- biochemical oxygen demand (BOD)** — The amount of oxygen used when organic matter undergoes decomposition by microorganisms. Testing for BOD is done to assess the amount of organic matter in water.
- blackwater** — Wastewater from a toilet.
- bulking agent** — An ingredient in compost, such as sawdust or straw, used to improve the structure, porosity, liquid absorption, odor, and carbon content. The terms “bulking agent” and “amendment” can be interchangeable.
- carbonaceous** — Containing carbon.
- carbon dioxide (CO<sub>2</sub>)** — An inorganic gas composed of carbon and oxygen produced during composting.
- cellulose** — The principal component of cell walls of plants, composed of a long chain of tightly bound sugar molecules.
- C/N ratio** — The ratio of carbon to nitrogen in an organic material.
- combined sewers** — Sewers that collect both sewage and rain water runoff.
- compost** — A mixture of decomposing vegetable refuse, manure, etc., for fertilizing and conditioning soil.
- continuous composting** — A system of composting in which organic refuse material is continuously or daily added to the compost bin or pit.
- cryptosporidia** — A pathogenic protozoa which causes diarrhea in humans.
- curing** — Final stage of composting. Also called aging, or maturing.
- effluent** — Wastewater flowing from a source.
- enteric** — Intestinal.
- evapotranspiration** — The transfer of water from the soil into the atmosphere both by evaporation and by transpiration of the plants growing on the soil.
- fecal coliforms** — Generally harmless bacteria that are commonly found in the intestines of warm-blooded animals, used as an indicator of fecal contamination.
- fecophobia** — Fear of fecal material, especially in regard to the use of human fecal material for agricultural purposes.
- fungi** — Simple plants, often microscopic, that lack photosynthetic pigment.
- graywater** — Household drain water from sinks, tubs, and washing (not from toilets).
- green manure** — Vegetation grown to be used as fertilizer for the soil, either by direct application of the vegetation to the soil, by composting it before soil application, or by the leguminous fixing of nitrogen in the root nodules of the vegetation.
- heavy metal** — Metals such as lead, mercury, cadmium, etc., having more than five times the weight of water. When concentrated in the environment, can pose a significant health risk to humans.
- helminth** — A worm or worm-like animal, especially parasitic worms of the human digestive system, such as the roundworm or hookworm.
- human nutrient cycle** — The repeating cyclical movement of nutrients from soil to plants and animals, to humans, and back to soil.
- humanure** — Human feces and urine composted for agriculture purposes.
- humus** — A dark, loamy, organic material resulting from the decay of plant and animal refuse.
- hygiene** — Sanitary practices, cleanliness.
- indicator pathogen** — A pathogen whose occurrence serves as evidence that certain environmental conditions, such as pollution, are present.
- K** — Chemical symbol for potassium.
- latrine** — A toilet, often for the use of a large number of people.
- leachate** — Any liquid draining from a source. Pertaining to compost, it is the liquid that drains from organic material, especially when rain water comes in contact with the compost.
- lignin** — A substance that forms the woody cell walls of plants and the “cement” between them. Lignin is found together with cellulose and is resistant to biological decomposition.

- macroorganism** — An organism which, unlike a microorganism, can be seen by the naked eye, such as an earthworm.
- mesophile** — Microorganisms which thrive at medium temperatures (20-37°C or 68-99°F).
- metric tonne** — A measure of weight equal to 1,000 kilograms or 2,204.62 pounds.
- microhusbandry** — The cultivation of microscopic organisms for the purpose of benefiting humanity, such as in the production of fermented foods, or in the decomposition of organic refuse materials.
- microorganism** — An organism that needs to be magnified in order to be seen by the human eye.
- moulder (also molder)** — To slowly decay, generally at temperatures below that of the human body.
- mulch** — Organic material, such as leaves or straw, spread on the ground around plants to hold in moisture, smother weeds, and feed the soil.
- municipal solid waste (MSW)** — Solid waste originating from homes, industries, businesses, demolition, land clearing, and construction.
- mycelium** — Fungus filaments or hyphae.
- N** — Chemical symbol for nitrogen.
- naturalchemy** — The transformation of seemingly valueless materials into materials of high value using only natural processes, such as the conversion of humanure into humus by means of microbial activity.
- night soil** — Human excrement used raw as a soil fertilizer.
- nitrate** — A salt or ester of nitric acid, such as potassium nitrate or sodium nitrate, both used as fertilizers, and which show up in water supplies as pollution.
- organic** — Referring to a material from an animal or vegetable source, such as refuse in the form of manure or food scraps; also a form of agriculture which employs fertilizers and soil conditioners that are primarily derived from animal or vegetable sources as opposed to mineral or petrochemical sources.
- P** — Chemical symbol for phosphorous.
- pathogen** — A disease-causing microorganism.
- PCB** — Polychlorinated biphenyl, a persistent and pervasive environmental contaminant.
- peat moss** — Organic matter that is under-decomposed or slightly decomposed originating under conditions of excessive moisture such as in a bog.
- pH** — A symbol for the degree of acidity or alkalinity in a solution, ranging in value from 1 to 14. Below 7 is acidic, above 7 is alkaline, 7 is neutral.
- phytotoxic** — Toxic to plants.
- pit latrine** — A hole or pit into which human excrement is deposited. Known as an outhouse or privy when sheltered by a small building.
- protozoa** — Tiny, mostly microscopic animals each consisting of a single cell or a group of more or less identical cells, and living primarily in water. Some are human pathogens.
- psychrophile** — Microorganism which thrives at low temperatures [as low as -10°C (14°F), but optimally above 20°C (68°F)].
- schistosome** — Any genus of flukes that live as parasites in the blood vessels of mammals, including humans.
- septage** — The organic material pumped from septic tanks.
- septic** — Causing or resulting from putrefaction (foul-smelling decomposition).
- shigella** — Rod-shaped bacteria, certain species of which cause dysentery.
- sludge** — The heavy sediment in a sewage or septic tank. Also called biosolids.
- source separation** — The separation of discarded material by specific material type at the point of generation.
- sustainable** — Able to be continued indefinitely without a significant negative impact on the environment or its inhabitants.
- thermophilic** — Characterized by having an affinity for high temperatures (above 40.5°C or 105°F), or for being able to generate high temperatures.
- tipping fee** — The fee charged to dispose of refuse material.
- vector** — A route of transmission of pathogens from a source to a victim. Vectors can be insects, birds, dogs, rodents, or vermin.
- vermicomposting** — The conversion of organic material into worm castings by earthworms.
- vermin** — Objectionable pests, usually of a small size, such as flies, mice, and rats, etc..
- virus** — Any group of submicroscopic pathogens which multiply only in connection with living cells.
- waste** — A substance or material with no inherent value or usefulness, or a substance or material discarded despite its inherent value or usefulness.
- wastewater** — Water discarded as waste, often polluted with human excrements or other human pollutants, and discharged into any of various wastewater treatment systems, if not directly into the environment.
- Western** — Of or pertaining to the Western hemisphere (which includes North and South America and Europe) or its human inhabitants.
- windrow** — A long, narrow pile of compost.
- worm castings** — Earthworm excrement. Worm castings appear dark and granular like soil, and are rich in soil nutrients.
- yard material** — Leaves, grass clippings, garden materials, hedge clippings, and brush.

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