Chapter 5

Integrated archaeology:

A garbage paradigm

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As founder and director of the Garbage Project, most of my career has been spent cheek-to-jowl with modern refuse. From the outset, the primary goal of Garbage Project research was to demonstrate the utility of archaeological methods and theories for achieving a better understanding of issues of current public concern – including assessments of resource waste and proposed methods of waste minimization, measures of diet and nutrition, evaluations of household participation in recycling programs, identification of household-level sources of hazardous wastes, cross-validation of census counts of minority populations, and providing base data for the design of new 'environmentally friendly' packages (for first-decade and second-decade summaries see Rathje 1984a and Rathje 1996a). As a result, I have rarely discussed what the Project's understanding of the relation between contemporary garbage and the society that generates it means to archaeology. After twenty-five years of *garbology,* it is time to make those observations in an archaeological forum (one rationale for archaeological studies of contemporary industrial societies is presented in Rathje 1979a; see also Rathje *et al.* in press).

Over the past five decades there have been several archaeologists concerned with identifying the most productive type of archaeology – *new, behavioral, postprocessual, consumption-based,* and more. This paper suggests that none of these approaches alone can provide a comprehensive perspective of the present – or of the past. Only by combining them all into an *Integrated* archaeology can the most complete understanding of human behavior over the centuries, and including today, be acquired (see Rathje 1979b).

The key reference for the foundation of an *Integrated* archaeology is *Unobtrusive Measures: Nonreactive Research in the Social Sciences,* written in 1966 by Eugene Webb, an economist and jack-of-all-disciplines, and a few colleagues. The premise of the book is quite simple: neither interview-surveys of participants nor observations of participants are sufficient, either by themselves or in combination, to adequately describe, analyze, and understand the ways social systems both behave and evolve. The book argues for adding the analysis of material trace measures – archaeologists' expertise – to the mix. And, because none of the data acquisition perspectives are sufficient in themselves, the book

further argues for 'triangulating' mental, behavioral, and material records into a richer multi-dimensional perspective of the social systems under study. It took only a few years of archaeological garbage research for me to arrive at the same conclusion.

When the Garbage Project began in 1973, I believed – as most social scientists have come to understand, whether they admit it or not – that what people report they do and/or what they themselves believe they do is often very different from their actual behavior. Twenty-five years of Garbage Project studies strongly suggest that this belief is correct. For example, Garbage Project comparisons of interviewsurvey reports and alcohol containers in respondents refuse (sorting done with discarders' permission) quickly determined that respondents underreport the amount of alcohol they drink by 40 to 60 percent (see Rathje and McCarthy 1977, Rathje 1978, Dobyns and Rathje 1987, Rathje and Murphy 1992).

Such misreports of alcohol consumption, of course, came as no surprise. Nor was it a surprise that market researchers hired by alcohol purveyors and academic and rehabilitation alcohol researchers were already familiar with this pattern (see Rabow and Watts 1982, Rabow and Neuman 1984) – they did not know the exact underreports for specific population segments, but they did know that reports were almost always substantially lower than actual consumption. There was, however, one surprise for the Garbage Project – that, for a variety of reasons, these researchers focusing on alcohol use did not care to identify actual levels of consumption – alcohol researchers, because an alcohol problem is an alcohol problem whether a subject consumes one beer too many per day or fifteen, and market researchers, because, if the actual quantity of over-consumption of a market segment of drinkers were accurately reported, beer companies would be under immense pressure to curb ads and financially support alcohol treatment programs.

The point is that what people said they drank and observations of drinking behavior in controlled settings were not valid representations of actual drinking, and no one seemed to care about what the artifacts of drinking indicated. In effect, what they knew was enough for their own purposes, but not enough to comprehensively and accurately assess patterns of alcohol consumption. The same disinterest in the material realities of behavior is pervasive throughout our society. The keepers of U.S. Department of Agriculture's (USDA) national records as well as medical researchers did not want to know that their reports were not accurate representations of food use behavior. That would call into question decades of USDA records and medical research conclusions. As this reality became clear to the Garbage Project, it also became obvious that the only reason garbage archaeologists were asked to conduct studies of fresh refuse was because some major gaffe showed up in traditional interview-survey or observational methods.

As one example, the USDA sent out an RFP (request for proposals) in the late 1970s to verify its 'Nationwide Food Consumption Survey' (NFCS) interviewprotocols, which were to measure in-home food use in 30,000 households in 1980. Amazingly, the traditional way to 'verify' interview data is to give the

interview again – no matter that the same biases would be in place. In spite of this easily applied traditional method of verification, all of the research groups responding to the RFP asked the Garbage Project to examine refuse to further cross-verify respondent reports. To our surprise, the company that won the grant received it on the condition that the garbage aspect of the study be removed! I was told that was because the USDA could not afford to study garbage from even a subsample of 30,000 study households. As you might suspect, I was slightly disappointed.

My funk lifted considerably when the two components of the completed NFCS – (1) interviews of someone reporting for the whole household and (2) interviews of individuals within the household – were compared. The comparison showed that the final USDA survey results were out of kilter with each other by 40 percent – the households as a whole were reported to use 40 percent more food than the individuals within the households admitted to using. In 1982, the Garbage Project was contracted by USDA to find out what was wrong. That year, we duplicated the NFCS interview-survey in a sample of homes in Tucson (see Harrison *et al.* 1983, Ritenbaugh and Harrison 1984). It was reassuring that the Tucson results documented virtually the very same whole household/individual residents gap as the national results. Thanks to the permission of respondent households for the Garbage Project to sort their refuse, it was possible to compare food use recorded from package labels and from food preparation debris to interview reports (for more on the Garbage Project's methodology, see Hughes 1984, Dobyns and Rathje 1987).

Garbage/interview comparisons documented that the 'use' (this is the term of choice for nutritionists) of virtually every food was misreported, both in whole household and in individual responses, by 10 percent or substantially more – and all for what seemed to be interesting reasons (see Rathje 1984b, Dobyns and Rathje 1987). For example, we discovered the 'Good Provider Syndrome' – that the woman of the household usually overreported virtually everything the family ate as a whole; the 'Lean Cuisine Syndrome' – that individuals almost always dramatically underreport what they themselves eat as individuals; and the 'Surrogate Syndrome' – if you want to know how much alcohol the residents in a household consume, do not ask the drinkers, rather ask a non-drinker (Rathje and Dobyns 1987). Was the result of the Garbage Project study the addition of a garbage component to the NFCS? No, the result was the end of the NFCS and a whole new in-home/out-of-home 24-hour recall interview methodology that the Garbage Project could not possibly cross-verify on a large scale.

Medical researchers paid little attention to our similar cross-verification of the NCI's (National Cancer Institute's) Food Frequency Questionnaire (FFQ) which produced similar garbage/interview results (see Johnstone and Rathje 1986, Johnstone 1986). There was no attention, that is, until the recent report of a study in the *New England Journal of Medicine* that concluded that a high-fiber diet was not protective against colon cancer (Fuchs *et al.* 1999). This report was based on the occurrence of colon cancer in a sample of 88,000 nurses who had

been given the FFQ every couple of years over the past 16 years. The study found that nurses who reported diets high in fiber were just as likely to contract the disease as those who reported that they ate relatively little fiber.

Suddenly, when the results did not meet researchers' expectations, medical and nutrition specialists were willing to concede that diet reports may be flawed. In fact, a Garbage Project cross-verification of the NCI's FFQ found that misreports of many high-fiber items and other foods ranged between 10 and 65 percent (Johnstone and Rathje 1986, Johnstone 1986). That Garbage Project study was completed 12 years ago!

Other areas of garbage research have led to results that have similarly been ignored. Take HHW (Household Hazardous Waste) (see Rathje *et al.* 1987a,b). At first, the Garbage Project found that HHW 'collection days' did not significantly diminish HHW in household refuse in three study communities (see Rathje and Wilson 1987, Wilson *et al.* 1994). In fact, in communities that did not publicize continued disposal opportunities for HHW, the quantities of HHW actually increased after one highly publicized community-wide event. This is probably because people were informed through media ads and community-flyers that they had HHW in their homes. When householders missed the pickup, they most likely felt that discarding HHW in their refuse was the only legal disposal opportunity they had available (Rathje and Wilson 1987, Rathje *et al.* 1987a). How happy do you think the cities that contracted the Garbage Project were to have these results published?

Today, relative to HHW there is another problem. For some reason, people tend to drastically misreport the quantities of specific forms of HHW they discard in one year (a typical interview-survey question) (see Rathje *et al.* in press). I personally don't know how much paint or how many batteries I throw out in a year – do you? As an example of the report problem, consider the responses to a telephone survey covering Marin county compared to hands-on sorts of the refuse from some 2000 households refuse pickups sampled in the phone-survey neighborhoods (see Rathje and Wilson 1987, Rathje *et al.* 1987a).

Two divergences in the survey versus garbage data jumped out immediately. Marin householders, especially if they were male, were likely to report changing their motor oil themselves and then discarding the old oil improperly. Motor oil was not common in sorted refuse. In fact, while motor oil represented 46 per cent of reported HHW discards, in actual garbage it was recorded as exactly half that figure – 23 per cent. In contrast, yard-related HHW was recorded as 16.6 per cent of total HHW in garbage sorts, but scored less than 2 per cent on phone survey records. An explanation? I believe the motor oil reports are Marin male macho – men want to believe that they change their own motor oil even when they don't. As for the yard wastes, most Marin residents hire landscaping services to care for their yards and don't pay attention to what their employees discard. End result: How can community services target those products that most need to be properly discarded if they receive information for interview-surveys that are nearly the opposite of what is recorded in the garbage by hand sorts?

I thought at the outset of the Project that people might be intentionally misreporting. I no longer believe that. I believe that either they do not have any concrete idea of what they consume and discard – likely, since we are not trained to remember such things as 'how many ounces of green beans did you eat yesterday' – or, people are fooling themselves. In some ways, it really does not matter which explanation is correct – deceit, ignorance, or not wanting to know. The end result is that what people say and/or believe they do is often strikingly different from their actual behavior. And, all too often, the response of companies, government agencies, and even academic researchers, is 'so long as our society keeps working, so what?'

Archaeology has traditionally been about what happens after the dust settles – literally. That settlement is, of course, thousands, hundreds, or dozens of years after the fact. But why wait until all or most of the subjects in a study are dead to truly understand the way their behavioral system worked? To understand what has transpired – or, perhaps more relevant to the current members of our society, what is transpiring – do we not need to understand all of the aspects of society? Do we not need to know the mental, behavioral, and material elements of our actions and how they all fit together in ways that keep society functioning no matter how incongruent its various components may seem to each other? In fact, I believe that no one can fully interpret one component of a social system without all the others!

One final, but critical, example of our lack of knowledge about ourselves in today's hyper-studied society: because of its mutagenic nature, fat from red meat was a big concern to nutritionists and medical researchers. In 1978 the USDA called the Garbage Project and asked how much of the 'separable' fat on steaks, roasts, and chops people cut off and discarded. The Garbage Project replied that we did not know much about the discard of meat fat. We considered meat fat to be inedible and did not record it as a distinct waste. The USDA representatives responded that the fat had calories and asked us to start recording it. We did, and we were greatly surprised by a summary of our data records a few years later (Rathje and Ho 1987).

We were able to record the amount of 'separable fat' on cuts of meat because the USDA constantly analyzes numerous pieces of meat to identify the quantity of separable fat that can be expected on various cuts, say a Porterhouse steak or a T-bone steak. Since we usually found meat packages labeled by both cut and weight, we could estimate the quantity of separable fat that would have entered the household. On the other hand, dogs and cats eat our data, or it may be ground down in garbage disposals. Nevertheless, there were no major changes in the frequency of dogs, cats, or garbage disposals in Tucson over the study years. As a result, we could look at trend data.

We found that the percentage of meat fat cut from fresh red meat that we were actually able to weigh and record remained constant between 1979 and 1982. But that percentage doubled in 1983 and has remained at that higher level since! In addition, we found that households began purchasing fewer steaks, roasts, and

chops in 1983. There was no reason for this we could think of, except that the National Academy of Science had published a highly publicized report in early 1983 that fat from red meat was a risk factor for breast and colon cancer (Committee on Diet, Nutrition, and Cancer 1983). Garbage Project results, at first, made the USDA and the NAS quite happy.

The problem was that in place of fresh red meat, people were not buying chicken or fish. They were buying salami, bologna, hot dogs, and other processed red meats in higher quantities. These processed red meats, of course, have higher fat content than most cuts of fresh red meat. The end result, which no one expected, was that the fat content in the diet from red meat remained the same or actually increased (Rathje and Ho 1987)!

Was the cause lack of understanding of medical jargon? In fact, most residents of sample households we asked about these behaviors thought that 'fat from red meat' – the medical jargon reported in the media – meant steaks, roasts, and chops; and that if the doctors had meant salami, bologna, and hot dogs, they would have 'said so.' Or was it the desire for convenience? We do not know. What we do know is that the picture of the American diet and people's understanding of what the medical community was saying was 'good' for them to eat were not in sync. To me, this says that, if they can, behavioral scientists should know all of the variables – mental, behavioral, and material – before they draw conclusions. Otherwise, historians might draw one conclusion from media reports – that people were concerned about disease prevention and cutting down on fat in their diet, while archaeologists might draw another – that in order to increase their energy intake, people were switching to higher fat sources! Only when all the data are available does the puzzle of inconsistencies become somewhat clearer.

I believe that this study clarified my thinking. As I have mentioned, I used to believe that people intentionally 'lie' in interviews today – in the past in texts and on monuments. Now, I wonder if the differences between mental and material realities are not mainly simple cases of people not mentally recognizing material realities and fooling themselves. This is a question for future archaeologists and other behavioral scientist to answer in tandem. For now, however, I believe that this is one of the most important questions related to human behavior for all behavioral scientists to answer. Only when all of these realities are in sync with each other can people plan rational public policies and make rational personal decisions that lead to expected results. And the only way to begin to provide quantitative information to bring the realities of behavioral systems into sync is to compare the separate realities all humans share – mental, behavioral, material – over time in an *integrated* archaeology! An *integrated* archaeology means reconstructing at least six very distinct and separate 'realities' that are components of behaviors. Such an integrated approach is important because the various behavioral measurement perspectives in use today are not mirrors of each other. They each have different biases. They each record different data. Thus, each adds a new and important dimension to the study of our behavioral system.

To an archaeologist, material artifacts are the starting point. Based on the significant role of material culture in our lives today, the role of these *material traces* (Rathje 1979b) in the methodology of behavioral science needs to be revised – and greatly heightened in prominence. The reason is that in both archaeology and the other social sciences, material traces have usually been measured as 'reflections of behavior' to document change. But material traces are not a simple mirror; they are a critical component that plays a leading role in the direction of behavioral change. Are McDonald's and other fast-food restaurants only a reflection of changing family eating habits and values, or were McDonald's *et al.* a part of the cause? To sort out roles in behavioral change, the recording and analysis of material culture must be a significant perspective in any behavioral science methodology designed to understand change – new patterns in artifacts, behaviors, and perceptions. I believe an *integrated* perspective should begin with actions. Actions are composed of a complicated integration of perception, behavior, and artifacts. To be complete, even a simplified model of actions must include all three of these domains along with specific perspectives within each domain (see Figure 5.1).

Perception elements are (1) general cultural rules and values that can be elicited from informants and (2) informant perceptions of what behavior, their own and the behavior of others, actually occurs as a result of these rules.

Behavioral elements are (3) records or direct observations of behavior and (4) common behavioral shorthand concepts (income level, ethnicity, demography, education level) used to classify people in ways assumed to have significance in terms of some degree of shared behaviors. One of the primary opportunities presented by an *integrated* research approach is to test such assumptions.

Material traces elements are quantitative data in the form of standardized measures of (5) material culture and its traces in specific environments and (6) the general natural, social, and economic environments in which human actions occur.

No one of these dimensions and perspectives provides a more correct or accurate view of reality than the others. They are, in fact, each equally real. The challenge comes from attempting to fit these separate realities into a coherent description and understanding of a behavioral phenomenon. The value of a holistic perspective that combines traces with other measures can be illustrated through an idealized analysis of food loss behaviors based on a series of actual Garbage Project studies. The central focus is the amount of food discarded, but a variety of perspectives define the elements of food loss actions and their synergistic effects. This is currently an active area of Garbage Project research.

1 *General cognitive rules and values.* Informants would be interviewed to determine the rules they use to make decisions about when to throw out food. For example, questions would be asked to determine an informant's general understanding of food knowledge, such as when food is safe to eat and when it is not.

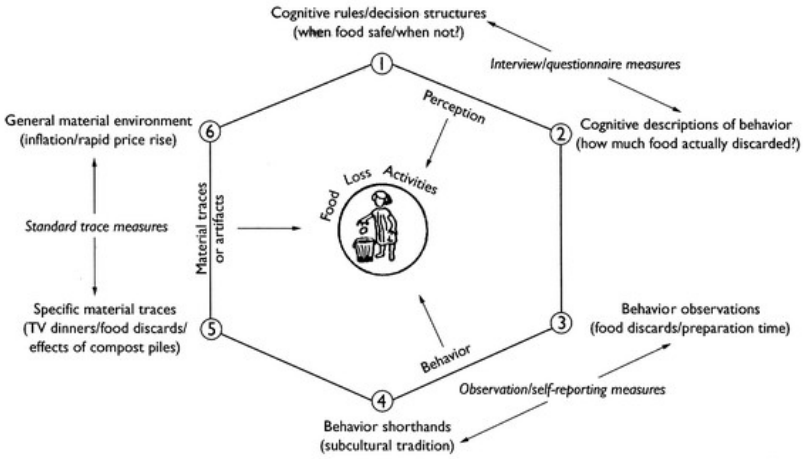

Figure 5.1 An integrative model of behavioral science research.

2 *Self-perceptions of behaviors.* To quantify the results of applying the cognitive rules described under perspective 1, informants would be asked to describe their own behavior. How much beef, for example, is actually discarded and how often in, say, a six-month time-frame?

3 *Behavior observations and records.* For this perspective, behavior would be directly observed; if it were not possible to make such observations, informants would be asked to self-report and keep records of their actions. These data would include information on actual discards that resulted from applying cognitive rules during an 'observation' period, say one week.

4 *Behavioral shorthands.* This perspective would be derived from census and other public data that record those variables considered significant in our society as ways of categorizing people – age, sex, education, income, and ethnicity.

5 *Material traces (material culture).* Household procurement and utilization would be derived from household refuse by recording packaging (such as microwave dinner trays and boxes, cereal boxes and bags, etc.), preparation debris (such as avocado pits), and food discards (actual weights of discarded once-edible food). Interview/garbage studies would be used to identify potential material trace biases, such as compost piles or garbage disposals.

6 *General material environments.* This viewpoint would record general natural, economic, social, political, and other environmental variables, including inflation rates and the general availability of food and other resources.

Although each of these separate realities may give an impression of internal coherence, the most useful coherence comes from comparing and integrating these independent perspectives. A few examples from Garbage Project studies will illustrate this point. Because archaeologists start from a materialist perspective, I will relate the other perspectives to item number 5 above, specific material traces.

5-1 *General cognitive rules – material traces.* Economists have argued that household food loss is a conscious choice that is made as a trade-off for more free time. As a result, they argue that studying specific food loss patterns would be pointless. In contrast to this argument, one survey/refuse comparison study indicates that a major correlate of food discard is the level of informant knowledge of food safety – the less knowledge, the more waste (Harrison 1976). As a result, education to a few simple rules of food safety might be useful in decreasing food waste.

5-2 *Self-perceptions of behavior – material traces.* Garbage Project studies indicate that it seems likely that the more people admit to waste, the less they actually waste. In other words, people sensitive to food loss may admit more waste, but actually waste less than those who are largely unaware of their waste patterns. Consider what the Garbage Project calls the 'Fast Lane Syndrome.' Those households that buy more pre-prepared foods and less fresh food, waste the highest percentage of fresh food. The result is that the households that buy less fresh food waste more of it than households that buy much more fresh produce (Rathje and Hughes 1977, Rathje 1996b). Ironically, householders who buy very little fresh food believe that they waste very little, when they actually waste quite a lot.

5-3 *Behavior observations and records – material traces.* It is also likely that preparation time relates to waste: the less time invested in preparing food, the more food is discarded. Back to the 'Fast Lane Syndrome.'

5-4 *Behavior shorthands – material traces.* There are lower food loss rates in Mexican-American neighborhoods than in White neighborhoods (Harrison *et al*. 1975, Harrison *et al.* 1983, Dobyns and Rathje 1987). This is likely attributable to the Mexican-American cultural background, both in terms of attitudes and values and in terms of types of foods used, preparation techniques, and ease of incorporating leftovers into other meals.

5-5 *Material traces – material traces.* Various attributes of packaging may affect loss and cross-cut population segment distinctions. Rates of food loss can be compared to types of package configurations and be recorded across neighborhoods to identify general loss/package patterns. For example, preliminary results show that canned vegetables are discarded at a lower rate than frozen vegetables. More important, food that is used regularly and comes in standard-sized packages is discarded at a much lower rate than specialty foods in specialty packages. The best example is bread. There is very little waste associated with standard 16 oz and 24 oz 'sliced bread' loaves. In most households, the slices are used regularly – toast at breakfast, sandwiches for lunch, and plain bread on the table at dinner. On the other hand, most wasted bread is specialty items, such as hamburger and hotdog buns, muffins, biscuits, etc. These breads are used irregularly for cookouts, for other special meals, and the like. Such specialty breads are wasted at a rate of 40 to 60 percent (Rathje 1986, 1996b, Rathje and Murphy 1992, Wilson *et al*. 1991).

5-6 *General material environments – material traces.* One early surprise in the Garbage Project's refuse studies was that during the well-publicized 'beef shortage' of 1973, the waste of edible beef was three times higher than it has been since. The increased loss of sugar products during the 1975 'sugar shortage' fit the crisis buying model worked out to explain the consumer reaction to the beef shortage (Rathje 1977).

While each of the six perspectives presented here is incomplete alone, together they form a comprehensive and integrated approach to any behavioral problem.

Environmental psychology is one of the forms of behavioral science closest to this total perspective. It concentrates on the relation between people's perceptions and behaviors and their physical environments, often national parks or buildings (Heimstra and McFarling 1978, Proshansky 1970). Nevertheless, usually only one perspective, either perception or behavior, is used to collect study data. One example is Yancey's (1970) discussion of the

behavioral consequences of the architectural design of Pruitt-Igoe, a low-income housing project in St Louis which won design awards but soon turned into a complete failure – in fact, it was blown up on national television in 1973. Yancey meticulously quantified and analyzed resident's perceptions. In contrast, few behavior observations were reported and no specific distributions of trash or trash collection facilities, unfinished construction, broken windows or graffiti were reported. Needless to say, actual behaviors and traces might have added depth and patterning in new dimensions unrecognized by either residents or researchers.

Two examples will suffice. First, researchers noted a urine smell on the elevators, but they did not mention that there were no ground-floor facilities for the legions of little children who played around the building. How many kids plan ahead for a slow or broken elevator when they are playing and nature calls? Second, there were no shutes on the building's floors for garbage; for proper disposal, residents had to carry their trash down an elevator or stairs and to the back of the building. While researchers did not comment on this physical reality, they did mention that it was obvious that some residents threw their refuse out their upper-story windows. How much will architects learn from one or two analysis perspectives on Pruitt-Igoe versus a wide range?

The value of an *integrated* multi-perspective analysis is also illustrated by Schensul, Paredes, and Pelto's study (1968) of rural northern Minnesota. The authors interviewed informants in rural areas and in Minneapolis-St Paul about their perceived quality of life and quantified their material possessions. The resulting total system was characterized as a 'twilight zone of poverty,' where poverty was experienced in rural households primarily in terms of self-perceived deprivations relative to the affluent sectors of society presented on TV, rather than as a quantifiable deprivation of specific material goods. Schensul and his colleagues concluded that investigation of poverty 'should include both the specific objective descriptions of the researcher and the perceptions of the members of the group under study.'

The approach of treating traces as independent variables does not alter the basic assumption of trace studies – that traces are related in a systematic manner to behavior/perceptions. This assertion has been demonstrated by the Garbage Project's research that identified the *First Principle of Waste,* derived by combining a series of Garbage Project studies (see *5-4, 5-5, 5-6* above). This principle originated with an explanation for the high rate of beef waste recorded during the nation-wide 'beef shortage' in 1973.

The Garbage Project's interpretation of high waste during the beef shortage was that consumers responded to the hype surrounding the shortage by purchasing meat when they found it in unfamiliar cuts (usually cheaper) and unfamiliar quantities (usually larger). Improper preparation and improper storage of these abnormal cuts and quantities resulted in waste. One year later, a 'sugar shortage' produced a strikingly similar pattern in residential refuse – the waste of sugar and sweets doubled while both were expensive and in short supply.

Recording these patterns led to the proposal of the *First Principle of Food Waste:* the less food use behavior varies over time, the less food is wasted. This principle explained why common sliced bread is wasted at a rate of less than 10 percent of purchase, while specialty breads are wasted at a rate of more than 35 percent. It also explains why Hispanics waste less food than Anglos: while prepared Hispanic foods are diverse, their basic ingredients are relatively few compared to the larger variety of foods in common Anglo diets. These and other patterns which can be deduced from the *First Principle of Food Waste* have implications for shopping and meal planning as well as for the design of pre-prepared foods and food packaging.

A form of corroboration for the *First Principle of Food Waste* came from an unexpected source. In 1986, the Garbage Project conducted the EPA's first study of household hazardous wastes in New Orleans and Marin County. One clear pattern in both communities was that potentially hazardous household commodities involved in regular maintenance tasks were wasted at much lower rates than those, such as paints and stains, which are used sporadically and were often wasted in bulk (Rathje *et al.* 1987a and 1987b, Wilson *et al*. 1991 and 1994). This last discovery, confirmed in every subsequent Garbage Project household hazardous waste study, led to the realization that the *First Principle of Food Waste* also covered hazardous discards and was more properly the *First Principle of Waste* (Wilson *et al*. 1991).

While the *integrative model* does not propose that archaeologists change their recording methodologies, it does propose that traces are not merely remains or reflections of behaviors; they are important components of behavior. This perspective is particularly useful today, when we face environmental, energy, and other crises that focus on mental–behavioral–material interactions. In fact, the role of traces in our behavioral systems has never been more relevant . . . and the archaeologists needed to document that role have never been more in demand!

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