Social Competition, Social Intelligence, and Why the Bugis Know More about Cooking than about Nutrition

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INTRODUCTION

THE *SINE QUA NON* of a human social institution is an underlying knowledge base. Just as societies vary in their institutional structures, so too do they vary in their knowledge: one society may have great expertise in irrigation techniques, another exhaustive knowledge of local flora and fauna, another of military strategy, and yet another a highly developed theology; many societies have multiple domains of expanded knowlege. While it is apparent that social institutions such as armies and religions require elaborate knowledge bases, so too do other institutions, including kinship-based organizations (which may require genealogical knowledge or an understanding of a complex kinship system) and political-economic structures. As we shall see, even so homely an institution as the household rests on knowledge of, for example, food preparation and the nutritional needs of children.

What processes led early human societies to develop the knowledge domains that they did? Detailed histories of Neolithic and earlier societies are largely irretrievable, of course, but we can look at more recent societies and ask questions about the social processes involved in the creation of their particular knowledge bases. The two knowledge domains with which we will be concerned — cooking and child nutrition — at first glance may seem far removed from the origins of social institutions, yet they are not. The evolved psychology that both constrains and enables the generation of these two domains is very likely the same evolved psychology that permitted the development of the local knowledge that underlay even the earliest of human social institutions. Asking what social processes are involved in the selection and elaboration of

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knowledge bases in a contemporary society may therefore give some insight into the origins of social institutions in general.

A knowledge base may have many dimensions. However, the two with which we will be concerned are those of elaborateness/extent, and of effectiveness in the real world.

The data were collected during the course of a study of foodways and nutrition funded by the Canadian International Development Agency and coordinated by Dalhousie University. The research focused on the nutritional status of pregnant women and of children under five in two small Bugis-speaking communities in Boné District, South Sulawesi. One community is an inland, rice-growing village (Taretta), the other a coastal fishing village (Panyula). The total sample of households studied was 156. Our concern was with diet, nutrition, and food processing. The data were collected during May–August 1999 and, at the time of writing, continue to be analysed.

In the course of this study, we became aware of a certain irony: on the one hand, knowledge of cuisine was highly developed; on the other hand, knowledge of nutrition was not. An evolutionary perspective seems to suggest that the cultural emphases should have been reversed — indigenous knowledge about nutrition should have had priority over indigenous knowledge of cuisine. This chapter explores that incongruity. The plan of attack will be, first, to define some terms; second, to prepare a theoretical context for the data; third, to describe indigenous knowledge about cooking; fourth, to describe indigenous knowledge of nutrition and the nutritional status of young children and their mothers; fifth, to seek to understand how it is that people can be better cooks than nutritionists; and sixth, to take the first steps towards developing a theory of the elaboration of knowledge bases in human societies.

DEFINITIONS

We will use 'culture' to mean a pool of shared information associated with one or more populations that may be geographically localized or widely distributed or both (Barkow 1989a). It is assumed that pools overlap, and that specific items of information may occur in any number of pools. Individuals use the information in these culture pools, selecting, revising, contributing, and 'transmitting' items. A particular individual may have access to more than one pool of information: the present age of 'globalization' is one in which information pools are constantly splashing into one another. These pools of cultural information can usefully be thought of as being composed of 'particles'. By 'particles' or 'information items' within a pool is meant very loosely what some have termed 'culturgens' (Lumsden & Wilson 1981), 'memes' (Blackmore 1999; Dawkins 1976), and 'traits' (Boyd & Richerson 1985). It is not assumed that

these particles are discrete — individuals constantly alter them in using them — while their 'transmission' is always problematic, involving inference and approximation rather than precise duplication (Boyer 1998; Sperber 1996). This process presumably involves various evolved mechanisms of the brain, so that different kinds of information may be processed differently (Barkow 1989a).

By 'cuisine' is meant a specific tradition of processing and preparation of food. By 'nutrition' is meant nourishment of the human body, the ingestion of nutrients that help to sustain the body in a state of health.

The term 'indigenous knowledge' is most often used in the context of socioeconomic development, where it is often associated with participatory approaches to development and with the issue of intellectual property rights. For present purposes, it will be used synonymously with the term 'local knowledge' and will refer to specific local knowledge domains. Thus, we will be speaking about indigenous knowledge of cuisine, food preparation, and child nutrition. (For useful discussions of indigenous knowledge, see Antweiler 1998; Ellen & Harris 1997; Grenier 1998; Nygren 1999; Rhoades & Bebbington 1995; Semali & Kincheloe 1999; Sillitoe 1998; Warren *et al*. 1995.)

THEORETICAL BACKGROUND

There appears to be no existing literature directly comparing the extent of indigenous knowledge of cooking with indigenous knowledge of nutrition. There also appears to be little or no literature concerning the processes whereby nutritional knowledge is generated over time, in a given society (except for studies of recent history of scientific nutrition). There is, however, a literature arguing that indigenous knowledge of food processing can increase nutritional value and/or remove toxins, and another that discusses the development of cuisines.

Adaptive food processing

We have been cooks for anywhere from 200,000 years (Brace 1996) to 1.6 million years (Wrangham *et al*. 1999: 572), presumably ample time to develop extensive knowledge of cooking. Not surprisingly, indigenous knowledge of beneficial food-processing techniques is not uncommon. Katz *et al*. (1974) found that Mayan processing of ground dried maize with limestone increases the tryptophan content while adding calcium to the diet (tryptophan being a precursor of niacin, a deficiency of which causes the disease pellagra). Bogin (1997: 117) points out that many of the foods people have eaten would be poisonous without considerable processing (e.g. manioc, horse chestnuts),

while rhubarb and cashews are toxic unless treated with heat before being eaten. Spice mixtures that kill or suppress harmful bacteria and fungi are common, cross-culturally, particularly in the warm regions where they are most needed (Billing & Sherman 1998). No doubt food-processing techniques that increase availability of nutrients and/or make food safer abound (cooking, in a great many cases, being an obvious example).

Unfortunately, we do not know where this beneficial indigenous knowledge comes from. One could argue that such information particles ('memes') are invented serendipitously and then become common through processes involving 'memetics' rather than genetics or the nature of human intelligence. For example, the rule of 'imitate the successful' (Barkow 1989a; Boyd & Richerson 1985) could explain the spread of such techniques, as others noticed that the innovators and their families were healthier than most. Such conjectures may be misleading because our sample of human societies is very heavily biased — in favour of survivors! We have knowledge of successful societies only. Groups that followed practices that left them more malnourished, diseased, or poisoned than competing societies have presumably been less available for study than groups that, among other things, got at least some of their nutritional practices right. Therefore, in studying indigenous knowledge and practices regarding food, we would expect that these in general lead to proper nutrition and health, but we should not expect perfection: some practices could be harmful.

Can local food prohibitions be maladaptive?

Are cultural food prohibitions (taboos) maladaptive (or at least unhealthy) for the individuals who follow them? One school of thought argues that they can be, at least potentially (e.g. Hull 1986; Katona-Apte 1977; Wilson 1973; Wolff 1965), while others are unconvinced and/or emphasize that it is poverty that is without doubt the most important cause of malnutrition. Various studies have found that, around the world, women often have food restrictions imposed on them, either during specific periods or in general; these tend to involve high-protein foods that are mostly likely to be forbidden during pregnancy (Rosenberg 1980). For example, Gabriella Ferro-Luzzi (1973) interviewed some 1200 women in Tamil Nadu, India. She found that the women were subject to over a hundred food avoidances associated with menstruation, lactation, and childbirth, and she concluded that these restrictions were harmful to the women and to their children. Marvin Harris (1987), however, points out that the Tamil Nadu women may have regularly violated the rules, the forbidden foods may not have been part of their normal diet even when not pregnant or lactating, and they could have been compensating by eating additional foods or larger-than-usual quantities of other foods. Moreover, as a further criticism Harris points out that Ferro-Luzzi used interview data rather than systematic

observation and measurement of what the women actually consumed. In support of his position, he gives us the example of Wilson's (1973) study of Ru Madu, a fishing village on the east coast of Malaysia. Wilson compared interview data on what women said they were not supposed to eat during the first 40 days post-partum with what two post-partum women actually ate during that period. There were marked discrepancies. Hull (1986) discusses ways of collecting and interpreting information about food taboos, and Laderman (1984: 547) argues convincingly for 'behavioral flexibility in the face of ideology' with regard to food behaviour.

More recent research has painstakingly focused on actual consumption and not merely claims of food restrictions. In general, the result seems to be that most of the time the restrictions make no difference, but occasionally they do. Aunger, for example, concludes that the impact of food taboos in his research area is slight, and 'only at the extreme range of undernutrition do further nutritional decrements actually translate into fitness differences' (1994a: 303). In his methodologically meticulous study (1994a, 1994b) conducted among four groups in the Ituri Forest in what is now the Democratic Republic of Congo, he found that there was evidence of lowered reproductive success (completed fertility) in only one of those groups, and then in less than 5 per cent of the women. These individuals most likely 'lived at the margin of energy balance' (1994a: 290). Kikafunda *et al*. (1998) found even less evidence of food taboos affecting health. They studied 261 infants/toddlers under 30 months old in Uganda. They did find much evidence of malnutrition, but anthropometric measurements showed no relationship between food taboos and either stunting or being underweight. Food taboos, in short, appear to have little or no effect on nutritional status and on genetic fitness. As Laderman (1984: 549) points out, the term itself seems to imply a rigid rule and a belief in supernatural repercussions if it is transgressed. In fact, as she discovered for a Malay village in Malaysia and as we found in South Sulawesi, food 'taboos' are better thought of as rules that may be interpreted flexibly or simply ignored. Moreover, for few if any societies do such prohibitions make up more than a small part of indigenous knowledge and practices regarding food and nutrition.

Two caveats are necessary before we begin describing indigenous knowledge of cuisine and nutrition in the two South Sulawesi communities studied. First, as we have already argued, it is a serious error to assume that people rigidly follow their food ideologies. Second, as we shall shortly see, the communities studied have not so much a system of 'food prohibitions' as a complex and varyingly known balance theory relating food, bodily state, and health to one another. Such a conceptualization should not be reduced to taboos or prohibitions, as the system as a whole may encourage the consumption of some foods even as it discourages the consumption of others, and may be interpreted differently from family to family.

CUISINE (INDIGENOUS KNOWLEDGE OF COOKING) IN THE STUDY VILLAGES

The simplest means of establishing the elaborateness and sumptuousness of Bugis cuisine would be to serve a meal typical of celebrations (Bug. *pesta*). Perhaps in the future, multimedia presentations will permit virtual meals, but for the moment we must dine on description. Paul Rozin's (1987) concept of 'flavour principle' is useful here. Rozin pointed out that national cuisines tend to have distinctive flavours due to the use of certain ingredients. For Chinese food, Rozin informs us, the ingredients are ginger, rice wine, and soy sauce; for Mexican food they are chilli peppers and lime and/or tomato. For Bugis food, the research team — which included several individuals expert in Bugis cuisine, and who consulted friends and family members — determined that the distinctive flavour principle is derived from the following ingredients, in order of priority:

- candlenut
- onion
- tamarind
- white pepper

Additional ingredients frequently found in Bugis cuisine are coconut milk, chilli peppers, and *terasi* (fermented fish or shrimp paste; *terasi* is Indonesian, *tarasi* is Bug.). Bugis food in part symbolizes Bugis social identity, and *lawa* (Bug. chopped raw fish or vegetable and grated coconut, seasoned and mixed with an acid such as lime juice) is the dish that my Bugis colleagues agree is especially 'Bugis'. (Not surprisingly, informants from the fishing village studied particularly prized *lawa bale*, fish lawa.)

Bugis people are not the only ones who enjoy Bugis food. Christian Pelras (1996: 228), author of a comprehensive study of the Bugis kingdoms, describes how one James Brook, visiting the region in 1840, was singularly impressed, while Pelras himself writes about 'the excellence and delicacy of Bugis cooking, which can be experienced not only among aristocratic families but also in very simple and even poor households' (1996: 22). He adds that 'sweets and pastries . . . are produced in innumerable variety' (228). Susan Millar (1989), in her tightly focused study of weddings and status in another Bugis district, Soppéng, discusses the immense amount of care and labour involved in the preparation of the food served at a Bugis wedding and the importance for determining the hosts' status of the foods' variety, quantity, and quality. (Today, in the more urban areas, families are likely to hold the wedding at a restaurant, substituting money for the clients who, in more rural areas and in the past, would have done the wedding cooking; even in rural areas, some families will now hire a professional caterer.)

Below are a number of recipes, collected in the study villages by Dr Elly Ishak, which may give some sense of the nature of Bugis cooking.

Bugis recipes

Masak santan (mixed vegetables in coconut milk)
Vegetables (immature jackfruit, pumpkin, eggplant) are cooked in coconut milk with turmeric, onion, chilli peppers, and lemon grass.

Beppa janda
A wrapper is made from finely grated cassava and salt. It is rolled into a tube around a banana. The dish is steamed, then served sprinkled with grated coconut. (*Beppa janda* is eaten both as a snack or as part of a lunch or supper.)

Nasu likku (coconut cream chicken)
Chicken is cooked with coconut milk and onion, garlic, candlenut, caraway seed, pepper, galangal, laurel leaf, lemon grass, palm sugar, and salt. *Nasu likku* is served either with steamed rice or with boiled rice cake (Bug. *burasa*).

Bale tapa (fish smoked over a grill)
Ground candlenut, chilli, garlic, onion, and soy sauce are mixed together with fresh fish (usually milkfish), which is then either roasted or grilled.

Nasu bale (stewed fish).
The most commonly used fish for this dish is fresh *cakalang*, a type of tuna. The fish is thoroughly cleaned, then cut into several pieces and washed until all the blood has been removed. It is put in a pot together with water, turmeric, onions, tamarind juice, monosodium glutamate, and salt. The pot is brought to a boil, then simmered for 45–60 minutes.

No claim is here made that these and other Bugis dishes are unique, or that other Indonesians would consider Bugis cooking superior to that of their own home regions — Indonesia is a land of notable regional cuisines, after all, and there are certainly marked similarities between Bugis food and, for example, the Malay dishes described by Wilson (1986). The only point of this discussion is to establish that the women interviewed (cooking is gendered, with men being in principle forbidden even to enter a kitchen, though they may grill some foods in the garden or aboard their fishing boats) in the two study areas had extensive knowledge of and skill in cooking, permitting us the generalization that the knowledge domain of cuisine is well developed and highly effective in the local culture.

UNHEALTHY LOCAL KNOWLEDGE OF NUTRITION: SOME LIKELY SUSPECTS

It is important to make clear at the outset what is *not* being argued. First, it is not being argued that the major cause of malnutrition in the two communities is indigenous knowledge of nutrition or food ideology or lack of education about scientific nutrition; poverty is no doubt the major cause of malnutrition in both populations. Second, it is not being argued that diet is the sole cause of malnutrition; parasitic infections (e.g. nematodes) and other diseases may also play a role, but, as no data on their prevalence were collected, they will not be discussed. Third, no implication is intended that the food beliefs and lack of nutritional knowledge prevalent in the study communities are unique; as we will see, it is the *lack* of uniqueness that gives the data their theoretical import. Fourth, while the focus of the discussion is on food beliefs and practices likely to be contributing to malnutrition in the study communities, it is not being argued that such practices are typical; a great many local food practices and beliefs no doubt make for healthy eating. For example, drinking water was invariably first boiled and then kept in covered containers in the study villages, as has long been the practice in the Bugis communities of South Sulawesi (Pelras 1996). What *is* being argued is simply that local knowledge and practice in some cases appear to contribute to malnutrition.

The clearest example the research team found of a local food belief and practice likely to have a negative impact on nutrition was denying the newborn the mother's colostrum. (Colostrum is the pre-milk breast secretion; the actual milk does not appear until the second or third day after birth, or even later.) Colostrum is quite important for the health and nutrition of the infant (Barkow & Hallett 1989). Not only does it provide the neonate with sterile fluid, it also permits it in effect to share the mother's immune system until its own has matured somewhat. Popular books today focus on the health benefits of colostrum (e.g. Hawken 1999; Ley 1997), while current animal research finds that it not only provides immunological advantages but also increases the general vitality of the young animal (Blum *et al.* 1997; Burrin *et al.* 1997; Hadorn *et al.* 1997). Key informants in both study communities (including ritual practitioners/healers (Ind. *dukun*, Bug. *sanro*) and older women in general) agreed that, in the past, infants would be given the breast only on the third day so as to avoid the colostrum. One woman, telling us that with her later children she had followed the health post's advice to give the breast immediately, remarked that doing so had been distasteful and difficult. Colostrum denial was found in approximately one-third of the Human Relations Area Files societies for which data were available (Barkow & Hallett 1989: 305). The practice has in the past been common in Indonesia and in Thailand (Van Esterik 1989: 129), but today it is waning due to the influence of education, the

local health posts and (in the case of Indonesia) government training programmes for *dukun*; it remains common in the study villages, though precise data were not collected. It seems possible that colostrum denial is to some degree responsible for the high rate of morbidity in the communities studied: of the 199 children aged 0–60 months in the two study samples, approximately 25 per cent were described by caregivers as having been ill during the three weeks prior to the interview.

A second idea that appears likely to have nutritional impact in the two study communities is the belief that pregnant women should eat little, and especially not 'hot' foods (which tend to be the high-protein foods). (As was discussed earlier, similar prohibitions have been very common in much of the world.) This was regularly explained in terms of avoiding having a large infant who might be difficult to deliver and whose birth might tear the perineum. Two health-centre midwives interviewed in the farming village of Taretta explained that women in the early stages of pregnancy often believed that they should not drink milk, and that in the later stages they should avoid meat, beans, and peanuts. (They do, however, believe that it is important that they eat vegetables.) Lack of proper maternal nutrition during pregnancy can result in a low birthweight infant (that is, under 2.5 kg at birth); low birthweight babies are susceptible to neurodevelopmental disorders, including cerebral palsy, and may suffer from poor health later in life. For Taretta, some 33.3 per cent of the 97 infants in the study sample had low birthweight; for Panyula, the comparable figure was 11.3 per cent of 102 infants. Because low birthweight is not necessarily caused by poor maternal nutrition (pre-term delivery is a possible cause, for example), the data can only be considered suggestive; the belief that pregnant women should eat little, especially of high-protein foods, may be having a negative effect on foetal growth and infant health.

A third belief (similar to that described by Laderman (1984: 553) for a Malaysian village) is that children will develop a parasitic infection — usually described as 'worms' (Bug. *cacingan*) — if fed too much fish; the stomach is said to swell and 'makes noises'. (One informant, in explaining this belief, quickly added that 'now we know that it is caused because their hands are not clean'.) Survey data collected and an analysis of the nutritional adequacy of the diet (based on a 24-hour dietary recall survey) shed some light on young children's fish consumption. Dietary recall data and anthropometric measurements are only snapshots which refer to a single point in time and do not reveal possible seasonal variation, and the present study could only collect data at a single point. However, Table 1 shows that of the 23 Taretta children aged 12–23 months old in the sample, 30.4 per cent were never given fish to eat. For Panyula, of the 27 children of that age in the sample, 18.5 per cent did not receive fish. If we move to the 24–60 month age group (Table 2), these figures change: for Taretta, 57.7 per cent of the 52 children in the sample received fish

Table 1. Percentage of children 12–23 months given specific foods in Taretta (n = 23) and Panyula (n = 27).

Type of food	Never		1–3 times per month		1–2 times per week		3–6 times per week		Every day	
	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula
Infant formula	95.7	92.6	0.0	0.0	4.3	0.0	0.0	0.0	0.0	7.4
Processed food	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other milk	82.6	77.8	0.0	14.8	4.3	3.7	8.7	0.0	4.3	3.7
Meat (beef/goat/etc.)	56.5	77.8	43.5	18.5	0.0	3.7	0.0	0.0	0.0	0.0
Fish	30.4	18.5	4.3	0.0	0.0	7.4	17.4	22.2	47.8	51.9
Poultry	43.5	77.8	52.2	22.2	4.3	0.0	0.0	0.0	0.0	0.0
Liver (beef/chicken)	61.9	79.2	38.1	20.8	0.0	0.0	0.0	0.0	0.0	0.0
Eggs	28.6	16.7	14.3	16.7	23.8	37.5	33.3	29.2	0.0	0.0
Tempeh/tofu	76.2	66.7	9.5	16.7	9.5	12.5	4.8	4.2	0.0	0.0
Mung bean/peanut	9.5	25.0	4.8	25.0	19.0	12.5	33.3	29.2	33.3	8.3
Green leafy vegetables	4.8	16.7	4.8	12.5	4.8	16.7	19.0	25.0	66.7	29.2
Red/yellow vegetables	38.1	50.0	42.9	16.7	14.3	20.8	4.8	8.3	0.0	4.2
Red/yellow fruits	33.3	4.2	14.3	33.3	38.1	20.8	4.8	33.3	9.5	8.3
Other fruits	9.5	4.2	4.8	0.0	42.9	25.0	28.6	50.0	14.3	20.8
Fruit juice	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snack	14.3	16.7	9.5	0.0	38.1	20.8	23.8	29.2	14.3	33.3

Table 2. Percentage of children aged over 24 months given specific foods in Taretta (n = 52) and Panyula (n = 47).

Type of food	Never		1–3 times per month		1–2 times per week		3–6 times per week		Every day	
	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula	Taretta	Panyula
Infant formula	98.1	97.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processed food	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other milk	55.8	31.9	7.7	25.5	26.9	21.3	3.8	4.3	5.8	17.0
Meat (beef/goat/etc.)	65.4	61.7	28.8	34.0	5.8	2.1	0.0	0.0	0.0	0.0
Fish	0.0	0.0	5.8	0.0	9.6	4.3	26.9	6.4	57.7	89.4
Poultry	48.1	42.6	46.2	53.2	3.8	4.3	1.9	0.0	0.0	0.0
Liver (beef/chicken)	69.2	54.2	30.8	41.7	0.0	4.2	0.0	0.0	0.0	0.0
Eggs	12.8	0.0	23.1	41.7	33.3	33.3	28.2	12.5	2.6	12.5
Tempeh/tofu	82.1	45.8	10.3	37.5	2.6	12.5	5.1	0.0	0.0	4.2
Mung bean/peanut	5.1	20.8	7.7	33.3	25.6	12.5	30.8	25.0	30.8	8.3
Green leafy vegetables	2.6	4.2	2.6	4.2	17.9	25.0	30.8	37.5	46.2	29.2
Red/yellow vegetables	48.7	37.5	35.9	33.3	12.8	20.8	2.6	4.2	0.0	4.2
Red/yellow fruits	17.9	16.7	12.8	33.3	41.0	25.0	25.6	20.8	2.6	4.2
Other fruits	0.0	0.0	2.6	0.0	25.6	62.5	66.7	29.2	5.1	8.3
Fruit juice	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snack	2.6	0.0	2.6	0.0	17.9	25.0	59.0	33.3	17.9	41.7

daily, while for Panyula the comparable figure was some 89.4 per cent of the 47 sample children. In short, children often are not given fish to eat on a regular basis until they are two years of age. (Not surprisingly, they are given fish more often in the fishing village of Panyula than in the farming village of Taretta.) Does the presumed reduction caused by the 'fish causes worms' belief in the frequency and amount of fish given the children result in protein deficiency?

Tables 3a and 3b show that the protein intake of infants under two is not inadequate. The two- to five-years-old group for Panyula receives 98.3 per cent of the recommended daily amount (RDA), while that age group in Taretta receives 73 per cent RDA. Thus, beliefs notwithstanding, Panyula children are receiving adequate protein, and Taretta children only somewhat less. While one could argue that the 'fish causes worms' belief does lower the protein intake of the children of Taretta, more likely factors involve the fact that, first, fish are far less available in the inland community of Taretta than in the coastal fishing village of Panyula; second, the market of Taretta meets only every fifth day while that of Panyula meets every day, affecting food availability (particularly that of

Table 3a. Quality of nutrient intake in Taretta (n = 86).

Variable	6–11 months[a]			12–23 months[a]			◘ 24 months[b]		
	X[c]	RDA	%RDA	X	RDA	%RDA	X	RDA	%RDA
Energy	132.0	269.0	48.9	259.0	746.0	34.7	449.0	1250.0	35.9
Protein	4.5	2.0	225.0	8.5	5.0	170.0	16.8	23.0	73.0
Vitamin A (RE)	44.3	13.0	340.8	99.6	126.0	79.0	79.3	350.0	22.7
Vitamin D (RE)	0.6	6.6	9.1	2.1	7.0	30.0	3.9	10.0	39.0
Vitamin B1 (mg)	0.0	0.1	0.0	0.1	0.4	25.0	0.2	0.5	40.0
Vitamin B2	0.1	0.2	50.0	0.1	0.4	25.0	0.1	0.6	16.7
Niacin	0.3	3.0	10.0	1.0	7.0	14.3	2.4	5.4	44.4
Vitamen B6	0.1	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0
Pantotenic acid	0.5	0.5	100.0	0.6	0.7	85.7	1.1	0.0	0.0
Folate (mcg)	14.0	0.0	0.0	21.0	3.0	700.0	29.9	40.0	74.8
Vitamin B12 (mcg)	0.3	0.0	0.0	0.7	0.0	0.0	1.1	0.5	220.0
Vitamin C (mg)	1.4	0.0	0.0	1.9	8.0	23.8	5.1	40.0	12.8
Zinc (mg)	0.5	4.2	11.9	0.7	5.8	12.1	1.3	10.0	13.0
Iron (mg)	0.4	10.8	3.7	0.8	5.8	13.8	1.2	8.0	15.0
Magnesium (mg)	14.2	51.0	27.8	27.5	66.0	41.7	54.0	0.0	0.0
Sodium (mg)	30.1	199.0	15.1	48.0	401.0	12.0	72.6	0.0	0.0
Phosphorous (mg)	71.0	306.0	23.2	125.9	193.0	65.3	220.9	250.0	88.4
Calcium (mg)	28.2	336.0	8.4	43.5	196.0	22.2	39.4	500.0	7.9
Potassium (mg)	107.7	346.0	31.1	196.5	512.0	38.4	367.2	0.0	0.0
Copper (mg)	0.0	0.1	0.0	0.1	0.3	33.3	0.2	0.0	0.0

[a]RDA taken from WHO (1998) after adjusting for breastmilk intake.
[b]RDA taken from WHO (1998).
[c]X refers to 'mean amount'.

a food as perishable as fish); and, third, Taretta as a whole is less prosperous than is Panyula. It thus seems unlikely that the belief that fish cause worms in young children has any real nutritional impact in either village (a conclusion similar to that of Laderman (1984) for the same belief's effect in the Malaysian community that she studied). Even if the belief does affect the amount of fish given to the children, in both communities the two- to five-year-old group has other protein sources, including tofu and tempeh, mung beans and peanuts, and eggs.

Balance theory

Both study communities shared a version of balance or hot/cold theory that is similar though not identical to indigenous systems described for other areas of south-east Asia (e.g. those described for peninsular Malaysia by Manderson (1986), for Malays by Wilson (1973) and for Javanese by Hull (1986)). Many individuals interviewed described foods and illnesses as being either hot or cold, and the body itself as often being in either a hot or cold state. (However,

Table 3b. Quality of nutrient intake in Panyula (n = 87).

Variable	6–11 months[a]			12–23 months[a]			◘ 24 months[b]		
	X[c]	RDA	%RDA	X	RDA	%RDA	X	RDA	%RDA
Energy	173.0	269.0	64.5	340.0	746.0	45.5	520.0	1250.0	41.6
Protein	7.1	2.0	355.0	12.5	5.0	250.0	22.6	23.0	98.2
Vitamin A (RE)	44.2	13.0	340.0	121.4	126.0	96.3	130.9	350.0	37.4
Vitamin D (RE)	2.6	6.6	39.4	5.0	7.0	71.4	9.7	10.0	97.0
Vitamin B1 (mg)	0.1	0.1	100.0	0.1	0.4	25.0	0.2	0.5	40.0
Vitamin B2	0.1	0.2	50.0	0.1	0.4	25.0	0.2	0.6	33.3
Niacin	0.8	3.0	26.7	1.8	7.0	25.7	3.1	5.4	57.4
Vitamen B6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pantotenic acid	0.6	0.5	120.0	0.9	0.7	128.6	1.6	0.0	0.0
Folate (mcg)	12.3	0.0	0.0	23.9	3.0	796.7	35.3	40.0	88.3
Vitamin B12 (mcg)	0.7	0.0	0.0	1.2	0.0	0.0	2.3	0.5	460.0
Vitamin C (mg)	1.8	0.0	0.0	5.3	8.0	66.3	6.4	40.0	16.0
Zinc (mg)	0.5	4.2	11.9	0.9	5.8	15.5	1.6	10.0	16.0
Iron (mg)	0.5	10.8	4.6	0.9	5.8	15.5	1.4	8.0	17.5
Magnesium (mg)	18.0	51.0	35.3	39.6	66.0	60.0	62.0	0.0	0.0
Sodium (mg)	30.1	199.0	15.1	47.0	401.0	11.7	70.9	0.0	0.0
Phosphorous (mg)	114.8	306.0	37.5	188.5	193.0	97.7	342.6	250.0	137.0
Calcium (mg)	28.8	336.0	8.6	33.1	196.0	16.9	46.8	500.0	9.36
Potassium (mg)	147.2	346.0	42.5	336.7	512.0	65.8	518.7	0.0	0.0
Copper (mg)	0.0	0.1	0.0	0.1	0.3	33.3	0.2	0.0	0.0

Notes: see Table 3a.

some illnesses, explained one *sanro*, were due to supernatural causes.) But knowledge of this theory was not evenly distributed. During one group interview, as a 70-year-old *sanro* explained the system, two married women in their twenties listened with expressions of surprise on their faces. They afterwards explained that they had had little knowledge of the system as a whole, though they were aware that there were foods that pregnant women should not eat, foods for particular illnesses, and so forth. Older women generally had a greater awareness of the system than did younger women. (No men were interviewed on this topic.)

Focus groups and key informants from both communities agreed on what might be thought of as 'core' indigenous knowledge of nutrition. All those interviewed agreed that what was tasty and filling was good for the body, and that rice was by far the most important food — even the fishers agreed that rice was more important than fish, the second food that would be mentioned. ('You can always eat rice with salt, but with fish, you don't have a meal,' explained one man.) They also tended to agree that some foods were 'hot' and some were 'cold', as were some body states (e.g. pregnancy and menstruation are hot). Tables 4 and 5 summarize the consensus. There are degrees of being 'hot' and 'cold' both for people and for foods. A pregnant women is hot (ice is believed to cause miscarriage). A woman in labour is very hot and remains so after delivery, until (according to one *sanro*) her true milk comes in and she becomes cold (and

Table 4. Foods frequently described as hot and as cold.

Hot foods	Cold foods
beef	papaya
pineapple	sweetsop (Ind. *sarakaya*)
jackfruit	bananas
tiger mango (Bug. *pao maccan*)	chicken
goat	boiled rice
sticky rice	peanuts
sambal (*sambal* is Ind.; *peco ladang* is Bug; the term refers to a sauce made of chilli pepper, tomato, and *terasi*)	mung beans
	string beans
	eggplant
horsemeat	kelor (the pinnate leaves of the merunggai tree, eaten as a vegetable and considered to be especially cold — people are said to shiver after eating kelor)
palm sugar	
mango	
fermented cassava or rice (*tape*)	
fish	cassava
salt fish	yam
dried fish	breast milk
durian	cucumber
ginger	watermelon
	greater galangale (galangal)
	immature coconut

Table 5. Body states.

Hot	Cold
men	women
parturient women	infants
lactating women	
menstruating women	

therefore should eat hot foods to restore balance). A lactating woman is hot but milk is cold. Men are hotter than women. Meat is hot, as are the larger fish such as tuna. Ocean fish are hotter than freshwater fish. Two older key informants felt that eating hot food makes people more emotional, more easily angered and hot-tempered. People also tend to feel physically hot when they eat hot foods, and cold when they eat cold food. Older women explained that the hot foods they had avoided when younger now gave them no trouble (such as headache). When asked about pregnancy cravings, women and men occasionally listed hot foods that wives had craved and that husbands had done their best to supply, regardless of the hot state of pregnancy. There was agreement that if one was in a cold state then an especially hot food should be avoided, though (according to some informants) a food that was only somewhat hot would be safe, and in some instances a cold food would actually be advisable. One *sanro* explained that papaya, being cold, was good for fever. A lactating woman, being hot, should avoid palm sugar and other hot foods, while ensuring a good (cold) milk supply by eating cold foods. Healers varied in the details of their accounts.

Many specific food beliefs held by some individuals appear to have little to do with hot/cold theory but much to do with the kind of similarity of cause-and-effect found in 'sympathetic magic' and in homeopathic medicine. Thus, cucumber and papaya are not good for girls because they are watery and this will make the girl's vagina too wet and displease her eventual husband. Men should eat bamboo shoots and the head of the 'gold fish' (*Cyprinus carpio*) because these improve virility. (Eggplant, however, is said to cause male impotence.) Eating the 'giant squid' (Bug. *gurita*) will cause a pregnant woman to have a difficult delivery. Similarly, a pregnant woman should not eat seaweed lest she suffer the medical condition *mola hidatidosa* (Bug. *hamil anggur*, literally, 'pregnant grapes', in which the apparent pregnancy is due to the uterus being filled with grape-like growths). Coconut milk and oil make for an easy delivery, as does having the woman in labour take a mouthful of water and then spit it out. Pineapple can cause a miscarriage. A nursing mother must not eat banana blossom (which, as the fruit itself grows, appears to shrink, and is thought to cause the infant to shrink as well). A father-to-be must not kill any animal, though fishing is permitted. He must not eat duck lest his child be born

with webbed digits, and if he opens a water gate to flood his paddy his son will be born with a cleft palate. (The *sanro* interviewed also considered many foods to be curative for specific diseases, but these will not be listed here, in the interests of brevity.)

Food storage and processing

While anthropologists have traditionally collected 'beliefs', they have rarely looked at the consequences for nutrition of food storage, processing, and cooking techniques. Two members of the health team, Elly Ishak (a food technologist) and Faisal Attamimi (a pharmacologist and toxicologist), undertook work to address this gap. In general, they found no variation in basic cooking and storage techniques in the two communities, and little variation from household to household. Several food-processing practices, in their opinion, lowered the nutritional value of foods. Rice, a staple food, would be washed from three to six times in copious amounts of water. Unfortunately, this practice tends to remove the water-soluble vitamins; from a nutritional perspective, a single washing would be preferable. Vegetables would be washed, sliced, and then left to soak for long periods, presumably reducing much of the vitamin C and thiamine content. Vegetables would then be cooked for about 30–40 minutes, until very soft, resulting in additional vitamin loss. Earlier, the ingredients for making stewed tunafish were listed. The fish is simmered for 45–60 minutes. From a nutritional point of view a very brief cooking time would be preferable, as long cooking damages the protein and lowers its nutritional value.

Malnourishment, beliefs, and food processing

Table 6 shows that, among children under five years old, malnourishment in the two study villages ranges from about 35 per cent to 52.5 per cent (depending on village, type of measurement, and gender). (See Tables 3a and b for the nutritional analysis of the dietary recall survey.) As for the mothers of these children, Table 7 shows that, as assessed by standard anthropometric measures, 41.5 per cent of them are malnourished.

It is impossible to determine, from these data, the precise contribution to malnutrition (if any) made by beliefs about foods and by the techniques used in preparing food. Suppose, however, that poverty is the sole factor in the malnourishment the study documented; if so, then we should expect to find fewer malnourished infants and young children among those who are more prosperous than among those who are less prosperous.

The relationship between nutritional status indicators and socioeconomic indicators is shown in Table 8. The data were collected by Drs Nurpudji and Veni Hadju (both physicians and faculty members at Hasanuddin University

Table 6. Prevalence of malnutrition in children under five years by sex.

Nutritional status	Taretta (%) n = 102	Panyula (%) n = 97	Total (%) n = 199
Underweight			
boys	38.1	35.1	36.4
girls	38.3	42.5	40.0
Stunting			
boys	31.0	36.8	34.3
girls	35.0	52.5	42.0
Wasting			
boys	9.5	10.5	10.1
girls	5.0	5.0	5.0

Table 7. Nutritional status of mother.

Nutritional status	Taretta (%) n = 87	Panyula (%) n = 72	Total (%) n = 159
Arm circumference			
malnourished	48.3	33.3	41.5
normal	51.7	66.7	58.5
Body mass index (BMI)			
< 18.5	16.1	9.7	13.2
18.5–25	67.8	69.4	68.6
> 25	16.1	20.8	18.2

(UNHAS)). They used several measures of malnutrition: HAZ refers to height for age, WAZ weight for age, and WHZ weight for height (the Z stands for 'z-score'). The norms used are those considered standard by the World Health Organization. The indicators of socioeconomic status they used are self-explanatory, with the exception of the 'poor' category, which had to do with proportion of income spent for food. Families spending 70 per cent or more of their income on food were categorized as 'poor'; those spending a lower proportion of income were labelled 'not poor'. Only the relationship between WAZ (weight for age) and father's occupation achieves statistical significance ($p=.04$), though the relationship between WAZ and the 'poor' category is marginally significant ($p=.076$). HAZ (height for age) and WHZ (weight/height ratio) measures are not significantly associated with any of the socioeconomic indicators. Similarly, size of family, mother's education, and presence/absence of a television were not associated with any measures of malnutrition. It would appear that food beliefs/practices, and not just poverty, may contribute at least somewhat to infant and child malnutrition in the two communities studied. (An alternative interpretation is that those with slightly greater income choose not to use it to provide additional food for their young children. It would be interesting to replicate this study in communities with a larger proportion of genuinely prosperous families, using a larger total sample.)

Table 8. X-square significance between nutritional status and socioeconomic variables.

	WAZ-score		HAZ-score		WHZ-score	
	Normal	Underweight	Normal	Stunted	Normal	Wasting
Size of family						
< 5	42	26	40	28	64	4
6–10	50	28	49	29	72	6
> 10	4	3	5	2	6	1
p	ns		ns		ns	
Poor category						
Yes	76	51	76	51	118	24
No	20	6	18	8	9	2
p	0.076		ns		ns	
Mother's education						
◘ primary school	59	37	57	39	90	6
above primary school	37	19	37	19	90	6
p	ns		ns		ns	
Father's occupation						
farmer/fisher, labourer	56	42	57	41	91	7
Government official, own business	38	14	35	17	48	4
p	0.040		ns		ns	
Television						
Yes	34	18	33	19	50	2
No	62	38	60	40	92	8
p	ns		ns		ns	

DISCUSSION

The two domains of Bugis knowledge studied — cuisine and infant/child nutrition — both seem to be elaborate and extensive. They differ, however, in effectiveness. Bugis cuisine, if consensus about its quality is considered worthy data, is highly effective in producing many well-liked dishes. Bugis child nutrition, however, is rather haphazard, with practices that may be harmful to infants (particularly infants made vulnerable by other circumstances, such as illness). In the case of colostrum denial, it is very likely that this practice is harmful. Moreover, the preparation of vegetables and the long cooking of fish may also be contributing to malnutrition. That the less poor generally have children as malnourished as the more poor supports the real possibility that food beliefs and practices may be contributing to malnutrition in the study villages.

The thought here is not that Bugis food practices are particularly harmful or unique. It is important to keep in mind that many of the food practices and beliefs the research team found are more likely to be healthful than maladaptive; for example, in a world with little access to Caesarean sections (as was the case, historically), efforts to avoid large babies, in spite of the risk of low

birthweight infants (and all the sequelae attached), may actually increase completed fertility rates. Then, too, it may be that the danger of very young children choking on the small bones of fish may outweigh the benefit of additional protein. Many of the food proscriptions and prescriptions for particular bodily states could have unknown but nevertheless real health benefits. Moreover, the lack of systematic knowledge of nutrition is anything but unusual — historically, it has been true of all of the world's peoples.

The point of this discussion is not to dwell on the shortcomings of Bugis child-feeding practices, but to seek explanation for how it is that the same people who have a superbly effective knowledge of cooking have a very imperfect child-feeding knowledge domain. Why should this be so? Why is it that nutritionally wise beliefs and practices are not universal? In the two study communities, how is it that the indigenous knowledge of cooking that the women share permits them to prepare impressive and delicious feasts, while their indigenous knowledge of child nutrition is, at best, spotty, at worst, somewhat harmful? Why have they developed more expertise in cooking techniques than in child feeding? Why, in their food processing and cooking, have they not invented a set of nutrient-sparing techniques? It is as if, over historical time, far more thought and energy have been spent in perfecting a lovely cuisine than in determining how best to feed children! During the hundreds of thousands of years that we have been using fire, we have often become expert cooks, but we have usually remained relatively inept nutritionists.

Let us try to produce a provisional answer to this conundrum, so that we can return to our initial focus on the origins of the knowledge foundations of social institutions. A good place to begin is with the nature of human intelligence and its relationship to socially transmitted information.

Human intelligence in evolutionary perspective

Human intelligence seems to have evolved in part to keep our excessive reliance on socially transmitted information from having maladaptive consequences (Barkow 1989a, 1989b), and in part to solve problems of social living, including social competition (Byrne & Whiten 1988; Humphrey 1976, 1983; Whiten & Byrne 1997). (For an alternative view — that human 'creative intelligence' is largely the product of sexual selection — see Miller (2000).)

Our evolutionary history has left us with a hypertrophied reliance on socially transmitted information. Especially as children, we are deeply dependent on the pools of transmitted information we loosely call 'culture', pools that include, of course, indigenous knowledge. But this is a risky adaptive strategy: socially transmitted information can at times be ineffective or even maladaptive. Various processes (discussed at length in Barkow 1989a, 1989b) lead to this situation, as when ecologies alter so that formerly adaptive practices turn out to

have negative long-term consequences (e.g. climate change, overfishing, population growth, etc.), or when uncorrected errors gradually accumulate over time (e.g. 'colostrum is bad for the infant'). However, the most important source of 'bad' socially transmitted information, for present purposes, is a byproduct of social competition: self-interested bias. We tend to invent, edit, and revise socially transmitted information in ways that support our own interests both as individuals and as groups (e.g. 'our religion/ethnic group/class/academic discipline, etc. is superior to all the others').

This tendency for socially transmitted information to contain potentially maladaptive information has apparently led to selection for various error-correction mechanisms. For example, the problem of accumulating error seems to be dealt with in part by so-called 'adolescent rebellion', which (whatever its other functions) appears to serve partly as a general editing mechanism in which much that parents and others have sought to transmit to the young person is called into question, challenged, and compared with alternative particles of information (Barkow 1989a, 1989b). Another way of dealing with the problem of accumulating error may be our tendency to attend preferentially to high-status individuals and learn from them, rather than from those lower in status, thereby eliminating some less-than-adaptive practices in favour of some that have a higher probability of effectiveness in the real world (Barkow 1989a). Given that social status tends to be tied to genetic fitness (e.g. Cronk 1991), these high-ranking information sources are likely to be a better source of effective particles of culture than the low-ranking.

Perhaps the most powerful mechanisms for correcting socially transmitted information are those that track the self-interest of others in their roles as suppliers of information. If you are suspicious of the arguments we are making in this chapter, then you are exemplifying one of these mechanisms: distrust! We are often suspicious of the information conveyed by individuals and groups with 'vested interests', and we seek to evaluate their motives and biases and past record of accuracy. Suspicion also plays a role in the regulation of social exchange.

Social exchange is a core component of human society, a component that in the context of biological evolution is often referred to as 'reciprocal altruism'. Here we have another risky adaptive strategy — the benefits of mutual exchange of resources and of aid in general are obvious, but so is the risk of being cheated. One protective mechanism that appears to have evolved as a result is the specialized memory involved in reciprocal altruism. We readily recall every instance in which we have aided another, especially when the aid may not have been fully reciprocated (Cosmides & Tooby 1992); we tend selectively to forget instances in which others have aided us, especially those in which we ourselves never fully repaid the altruist: many a divorce case shows how effective our biased memories can be.

Another example of an aspect of human cognition that reflects the social nature of our evolutionary environment is that of gossip. Consider, for example, the strength of our interest in the sexual and status-related activities of high-ranking members of our local group. This interest is what underlies the trans-cultural universal gossip (Barkow 1992) and the modern phenomenon of the soap opera.

Consistent with the idea of social intelligence, we note that social competition serves to focus and even enhance our intelligence and problem-solving ability; when the competition is group competition, it increases our ability to co-operate. Knowledge domains related to competition will probably be the most elaborate and effective sectors of the cultural pool.

Finally, social competition and informational editing involve a rather brief timeframe during which feedback from physical and social events is evaluated. We seem adept at solving problems in which there is feedback in minutes and we are often successful even when feedback requires months. We are not very good at problems involving much longer timeframes, however.

Now we have some background theory about the nature of human intelligence and cognition and the various evolved mechanisms that serve to limit the amount of socially transmitted error in our cultural information pools. We are now almost ready to return to the core question of why Bugis knowledge of cuisine seems to be more effective than their knowledge of nutrition.

Human intelligence and indigenous knowledge

The discussion of the evolved psychology of human intelligence suggests that, for any domain of indigenous knowledge, one can ask the following questions:

- Is social competition involved in knowledge production?
- Does self-interest play a role in disseminating and revising information?
- Are the problems comparable to the difficulties of social living our intelligence arguably evolved to solve, particularly with respect to timeframe?
- What error-correction mechanisms are relevant? Are there specialized mechanisms primarily applicable to this domain?

Now, let us ask these questions of the Bugis domains of cuisine and of child feeding/nutrition practices.

Bugis cuisine

Bugis cooking historically involved competition. As was earlier discussed, at the Bugis *pesta* (celebrations), the hosts' status depends in part on the quantity and quality of the food produced. Susan Millar (1989) describes, for the

neighbouring District of Soppéng, the importance of weddings and other *pesta* in determining relative social position, and how quality and quantity of food (cooked by clients) plays an important role in establishing or confirming the relative standing of families. It is likely that, for centuries, Bugis-speaking women — and the Bugis nobility whose standing depended in part on display of elaborately prepared food (cookies in particular) — have sought skill in cooking. It has been argued that competition among aristocrats, the wealthy and chefs played an important role in producing *haute cuisine* in China (Anderson 1988; Mennell 1996; Mennell *et al*. 1992): the Bugis case would seem to fit this model. In France as well as China, *haute cuisine* is largely the province of males (though in recent years it has become less gendered), in spite of women being generally responsible for ordinary, household cooking. Among the Bugis, men are not permitted to set foot in the kitchen, even during preparations for a *pesta*; the exceptions to this rule are the *bissu* (Ind. *waria*, male transvestites), who are said to be the best cooks of all.

Self-interest in cooking no doubt exists and keeping recipes secret or transmitting misleading information about them are probably common in some societies; in the Bugis case, however, there appears to have been little opportunity or motivation for such informational editing. Cooking knowledge is transmitted by direct observation. One learns to cook by watching and assisting one's elders, who are usually one's close relatives. The problems of cooking are, however, similar in one major respect to those faced by our distant ancestors: they involve a brief timeframe. As the proverb has it, 'the proof is in the eating'; that is, validation or corrective feedback, as the case may be, occurs shortly after a dish has been cooked. As for evolved mechanisms, one could argue that the sense of taste is indeed such a specialized mechanism: we seem to automatically become experts in the cuisine with which we are raised, and errors or other departures are instantly apparent to us.

Infant/child nutrition

Is child nutrition a matter of competition? Though no specific data were collected on this point, it seems reasonable to assume that in the study villages — and probably everywhere else — mothers take pride in the health and vitality of their offspring, and where there is pride there must be an element of competition. Women in the study sites regularly sought expert advice on infant and child health from the *dukun* and the staff of the community health centres and posts, showing their strong concern for the well-being of their children. However, whatever competition may or may not have existed concerning number of healthy children, it is not comparable to the formalized competition of a *pesta*, with its elaborately prepared dishes on display as a claim to and legitimation of relative social standing.

Does maternal self-interest bias child-feeding knowledge and practice? From the perspective of evolutionary biology, this is possible: a mother might enhance her own ability to have additional children by scanting those already born, or she might increase her completed fertility rate by favouring the child who would benefit more from a given amount of food at the expense of one who would benefit less (e.g. an ill child or a very young one could benefit more from, say, an egg, then one who was healthy or considerably older). In the present case, none of the feeding practices observed or indigenous knowledge provided by key informants and focus groups suggests any such self-interested biases. Indeed, though this possibility was not a research focus, it seems more likely that any food saved by the mother would be consumed neither by her nor by her children but by the adult males. Women learn infant and child-feeding practices from their own mothers; new mothers are given explicit feeding advice by the *sanro*, and today, by health post personnel as well.

Are child-feeding problems comparable to the problems faced by our ancestors? In a sense they are simply the same problems — infants and children must be fed — but this fact is misleading. If human intelligence evolved primarily as a response to the problems of social life, the relevant question is whether infant/child-feeding problems today are in any way comparable to the social problems faced by our ancestors. As with the case of Bugis cuisine, the dimension that can be readily compared with domains involving social life problems is that of timeframe for effective feedback. Unlike cooking, for which the timeframe is indeed comparable in being brief, the timeframe for feedback from child feeding is slow and complex, making error correction very difficult. Compared with the immediacy of determining whether or not a cooked dish tastes good, the effects of feeding a child fish or fruit a bit more often are very unclear and may not be manifest for months or years (while the danger of small bones choking a child can, alas, be learned quickly indeed!). Child health is determined by many factors, and children do not react uniformly to varying diets, so that corrective feedback with regard to nutrition is unreliable.

Have we evolved specialized mechanisms pertaining to infant feeding? It is instructive to compare the strength of our interest in the sexual and status-related activities of high-ranking members of our local group (that is, our tendency to gossip) with the strength of our interest in a child's diet; the former is so great that soap operas can transfix us, but there are no television shows showing the drama of permutations of diet on an infant's nutritional health! Similarly, we readily recall every instance in which we have aided another, especially when the aid may not have been fully reciprocated, but the details of what a child once ate, years past, are only vaguely recalled. We have apparently never been selected for the ability to recall precisely how much of what food was fed to which child when and then to track this information against the child's future growth and health. Why not?

Why have we not evolved some kind of specialized infant/child nutritional 'mental organ' or 'nutritional intelligence module' to keep track of child (and maternal) feeding and nutritional health? Here, one can only speculate. Perhaps existing adaptations, discussed earlier in terms of our evolved taste preferences, have generally been adequate to ensure proper diet for both mothers and children. Perhaps having much choice in what to feed a child is a relatively new phenomenon. Perhaps the selection pressure for a nutritional health module has long been there, but there is no substrate which could develop into such an organ (because something would be adaptive is hardly a guarantee that it will evolve, after all). Perhaps it is rare for child-feeding practices to have a strong impact on total reproductive success. Perhaps systems of food prohibitions and balance theories are relatively new in the history of our species, and there has not been sufficient time for us to evolve specialized abilities to counter them. Unfortunately, we have no data with which to evaluate these possibilities. The infant-feeding practice that seems most likely to have affected fitness is that of colostrum denial, but it is not clear that it has ever been sufficiently widespread, or that it has been practised through enough generations, for it to have produced a countering evolutionary response.

We now are in a position to answer the question of why the indigenous knowledge domain of cuisine seems so much more effective than the indigenous knowledge domain of child feeding/nutrition in the two study villages (and, presumably, in other Bugis communities as well). Cooking, especially in this particular society, turns out to be a good fit for our social intelligence: skill in cuisine has, at least historically, been strongly connected with social competition; our sense of taste is an evolved mechanism providing fairly unambiguous feedback about the effectiveness of our culinary efforts; and this feedback is in the short timeframe to which our intelligence appears to be well adapted. For child feeding/nutrition, social competition was not visible and, if present, is certainly muted; we appear to lack any specialized evolved mechanisms to permit us to correlate the details of past feeding practices with the health and growth of our children; the feedback that we do receive occurs in a lengthy timeframe and is highly ambiguous, given the many factors that influence infant/ child health. It is thus not surprising that Bugis indigenous knowledge of cooking is more effective than indigenous knowledge of child feeding and nutrition.

THE KNOWLEDGE BASES OF HUMAN SOCIAL INSTITUTIONS

This serendipitous comparison of indigenous knowledge of cuisine versus nutrition has produced a general, testable set of hypotheses: accurate and extensive domains of indigenous knowledge are most likely to develop when they are (or have been) foci of social competition, when they can benefit from

specialized evolved mechanisms, and when the timeframe of corrective feedback from physical or social reality is rather short. Study of indigenous knowledge domains of many kinds and in many societies will be needed to evaluate these hypotheses and answer a range of questions. For example, do the hypotheses apply to agricultural knowledge, or to the raising of livestock? How short is 'short'? What is the impact of 'borrowing' knowledge and personnel from neighbouring societies?

Because in this chapter we are concerned with the origins of human social institutions, let us for the moment assume that future research will validate the hypotheses we have here developed. If so, then we can provisionally conclude that elaborate social organization and institutions would have arisen quite readily among our ancestors, because our social brains, specialized as they are in solving social problems, would have been able to generate the organizational knowledge needed. The more competition there was among individuals and groups involved in creating this knowledge, the more quickly it would have been produced and elaborated and the more effective it would have become. However, size and complexity of organization would have affected the speed and accuracy of learning from the consequences of actions: as a society grows larger, it seems likely that the time between the making of social organization decisions by leaders and the learning of the consequences of those decisions will grow longer.

The growth of technological knowledge, because our brains are not particularly well adapted to its production, seems especially likely to have been dependent on social competition. The hypothesis that the societies which developed effective technologies early were those that created competition among artisans suggests itself. For example, societies fostering competition among builders would develop a knowledge basis for construction more quickly than societies in which there was no such competition.

What of the situation in which there was strong social competition in a domain of knowledge that perforce offers little possibility of corrective feedback from an external reality, e.g. the realms of religion and philosophy? Here, too, wherever a situation of competition was created, we would expect an extensive generation of knowledge to result. Such knowledge domains would have and still do produce, at times, much beauty and perhaps insight into the human condition; however, because in no timeframe could there be corrective feedback from external reality, effective knowledge would not necessarily accumulate, and political processes would have been the main determinants of the relative standing of its producers. Even today, one could argue that the distinction between the humanities and the sciences is simply that, while for both political processes play major roles in the evaluation of the relative worth of intellectual contributions, the knowledge produced in the sciences is influenced by systematically sought corrective feedback from external reality, while

in the humanities there is no such dilution of political processes; instead, contending circles strive to make their own leaders and criteria for excellence of knowledge dominant (e.g. the debate over which literary works are to be included in the 'canon').

Students of human intelligence would do well to consider the archaeological record, along with the various domains of indigenous knowledge of extant societies, as natural experiments. To study cultural knowledge domains and the social processes whereby they may be created, maintained, edited, revised and deleted is to study the intelligence of our species *in situ*.

Finally, this analysis does yield at least one piece of practical advice concerning food: if you seek fine cuisine, go where there is a long history of competition among cooks.

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