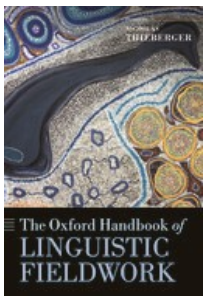

The Oxford Handbook of Linguistic Fieldwork

Nicholas Thieberger (ed.)

https://doi.org/10.1093/oxfordhb/9780199571888.001.0001

Published: 2011 **Online ISBN:** 9780191744112 **Print ISBN:** 9780199571888

CHAPTER

13 Technology

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https://doi.org/10.1093/oxfordhb/9780199571888.013.0014 Pages 298–316

Published: 18 September 2012

Abstract

This article centers on the importance of collaborating the study of linguistics with technology. Several decades were needed for anthropologists to realize that objects produced by humans in society are a social production. Indeed, any given object, be it a battleship, a hammer, or a stone picked up from the ground, is always a product of its fabrication or use, through gestures, skills, and knowledge which may vary from one culture to another. In other words, techniques are as responsible for producing social ties and types of information as they are for transforming the material world. As sociologists of science and modern technology put it when they refer to a 'seamless sociotechnical network', techniques and objects are embedded in other realms of social actions which we arbitrarily define and name for the sake of social sciences. And because techniques occur in all social actions, it may be incorrect to isolate a domain in human life and production as merely 'technical'. The anthropology of techniques is therefore merely one point of view among others on objects and techniques. It is the one that not only asks if an object is an element of a set of 'political', 'religious', 'economic', 'artistic', or other practices and representations, but also asks in what way its conception and its material production are characteristic of the human group that manufactures or uses it. Paying attention to the most physical dimension of technical actions is a way to reveal fundamental information about a cultureand its social organization or system of thought that is provided by no other anthropological approach.

Keywords: technology, social production, social ties, seamless sociotechnical network, material world

Subject: Linguistic Anthropology, Linguistics

Series: Oxford Handbooks

Collection: Oxford Handbooks Online

13.1 Introduction

Several decades were needed for anthropologists to realize that objects produced by humans in society are a social production. Indeed, any given object, be it a battleship, a hammer, or a stone picked up from the ground, is always a product of its fabrication or use, through gestures, skills, and knowledge which may vary from one culture to another. As Mauss stated in his paper on 'the techniques of the body' (2006[1935]: 77–95), this is true of every possible action on the material world. Here he demonstrated that even the most 'natural' actions we perform on *matter* (like walking, swimming, or giving birth) are, always and everywhere, cultural productions. At the same time as it has a physical function, a technique or an object is a component in a system of thought and action which is not particularly 'technical' itself. In effect, the material use to which a given technique or object is put, or the ideas one has about it, may well be related to social strategies, actions, or domains that have nothing to do with a transformation of the material world. Rather, this object or technique may be simultaneously related to non-technical activities. As we shall see, a New Guinea garden fence is by no means only to keep pigs away from sweet potatoes. Similarly, people would agree that, today, sport shoes are as much related to identity and social interaction as designed for jogging.

In other words, techniques are as responsible for producing social ties and types of information as they are for transforming the material world. As sociologists of science and modern technology put it when they refer to a 'seamless sociotechnical ↳ network' (Hughes 1986), techniques and objects are embedded in other realms of social actions which we arbitrarily define and name for the sake of social sciences. And because techniques occur in all social actions, it may be incorrect to isolate a domain in human life and production as merely 'technical'. However, while not belittling or forgetting the bulk of human material productions, we can at least loosely decide where techniques start, or how they are conveyed in an action—and, by definition, by an action on matter.

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The anthropology of techniques ('technologie culturelle' in the French tradition, and 'material culture studies' in the British tradition) is therefore merely one point of view among others on objects and techniques. It is the one that *not only* asks if an object is an element of a set of 'political', 'religious', 'economic', 'artistic', or other practices and representations, but *also* asks in what way its conception and its material production are characteristic of the human group that manufactures or uses it. Paying attention to the most physical dimension of technical actions is a way to reveal fundamental information about a culture and its social organization or system of thought that is provided by no other anthropological approach.

13.2 Techniques as Actions on the Material World: Some Key Ideas

For anyone interested in action on matter, the purpose of an object cannot be understood without the gestures and knowledge needed to put it to use. The term 'operational sequence' (the series of operations to be performed) designates the overall process that leads from a given state of matter to its transformed state. Usually, there is nothing to indicate where an operational sequence begins or ends. Why separate the felling of the trees from the manufacture of the adze making the felling possible; or the making of the drum fashioned from the section of the tree trunk being cut up? These arbitrary divisions depend on the questions asked, but are certainly no reason not to tackle the problem.

The expression 'technical system' is used by Mauss (2007[1947]) in his *Manuel d'ethnographie,* in which, for the purposes of his analysis, the technical system is presented as an isolated aspect of social reality. The notion of a technical system was further developed by the historian Gille, who made it the fundamental concept of his *Histoire des techniques* (1978). As far as ethnographic description is concerned, techniques

have a systematic character which can be characterized with three levels of interaction (Lemonnier 1992: 4–11).

On the first level are the components, or elements, that interact with each other in any given technique
p. 300 (understood as a specific action on matter, delineated by the ↳ anthropologist, for whatever reason), for example, tying your shoelaces, landing a Boeing 777, or carving chips from a block of wood. These components, or elements, which interact with one another are: the matter being acted on (which can be the body itself when one walks, swims, dances, etc.); tools; gestures; one or several sources of energy; actors; and 'representations'. The components involved in any action aimed at obtaining some material result physically fit together, or are at least more or less mutually compatible in a physical sense. They form a system, in the simplest sense of the term, defined by the fact that a change in one element can lead to the modification of one or more of the others. If heating milk in a saucepan, control of the transformation from cold to boiling is different on an electric plate and on a gas hob. The heat remains when the electric power is cut, whereas it stops almost instantly with a gas cooker.

The term 'representation' deserves special attention, as it is deliberately vague and includes the extremely complicated processes labelled 'skills'—understood as 'care, judgement and dexterity' according to Ingold (1997: 111)—as well as sets of culturally shared ideas about the components comprising a given technique. These skills are part of what anthropologists call 'implicit' or 'tacit knowledge'. This type of knowledge is more of the type 'to know *how*' rather than of the type 'to know *that*' (Varela, Rosh, and Thompson 1993: 208), and it is not restricted to information about how to make the gestures and operations involved in a technical action. It is also made up of particular mental *skills*, for instance, abilities to evaluate a situation in a fraction of a second and to adapt the ongoing technical process to it (Descola 2006: 11).

This 'know how' does not comprise a series of instructions or images listed somewhere in the brain that would constitute a sort of program to be executed. As a result, 'it is not through the transmission of (programmatic forms of rules and representations) that skills are learned, but rather through a mixture of improvisation and imitation in the setting of practice' (Ingold 1997: 111). This 'know how' and skills are embodied and drive actions that are made automatically: for instance, you normally have no consciousness of the many and complex tasks you perform while driving (Bloch 1998: 3–21).

'Actors' and 'energy' are also quite ambiguous terms because, from an emic point of view, some participants and powers in a technical action may belong to what we call the supernatural domain, in which the relationship between means and ends violates western scientific knowledge (to whistle in order to chase the rain away is an example of such a violation).

At a second level, in any one given society and at a given period of time, various techniques are linked with each other in various ways and for various reasons. Here are some examples:

- A technical action depends on the preceding actions: you have to go and cut canes and saplings before
p. 301 you can lash together roof beams for your house; if ↳ there are no tires produced and transported to a shop, you cannot get a complete wheel installed on your car; you have to remove the egg's shell before you put it in a frying-pan.

- Different techniques may use the same tool or machine (think about all the situations in which you have to screw or tighten something or pull something out with pliers or pincers); millions of different products can be made by lathes or drilling devices.

- Different techniques can include identical steps (pieces of an operational sequence): whether you build a New Guinea house or a garden fence, you have to fell trees and make planks or posts out of the trunks. Welding sheet metal together is an operation common to many industries.

- Different techniques can rely on the same actors, raw materials, etc.: for instance, the person who welds iron sheets in a car factory during the week is the same one who uses a lawnmower at the weekend or a coffee machine every morning. The raw material that is ordinary salt has innumerable culinary or chemical uses.

- Techniques can result from the embodiment of identical representations in gestures and objects: e.g. knowledge about transformations for clay or iron underlies thousands of technical processes.

In this respect, it is worth noting that Leroi-Gourhan's program on the 'elementary means of action on the matter' (1971[1943]; 1973[1945]) has not yet been seriously documented. Such an elementary means is, for instance 'mixing': whether you are preparing mayonnaise, cement, or orange cordial in a glass of water, you are performing a similar elementary action. How such a universal physical action is actually used by people has never been investigated; nor, as yet, have anthropologists tried to get information on the mental apparatus lying beyond such 'representation' (say, 'adding some kind of liquid to a denser liquid, powder, or solid, gives a paste and homogenizes it, etc.').

At a third level, the ways in which a technique or an object is manufactured, used, or exchanged is linked to practices and thought systems that go well beyond simple material effectiveness. A technical system is therefore always part of the sociocultural whole that includes it. Social representations of techniques include more than the strict domain of action on matter.

As a result, the relationship networks which material actions have with other social acts, or techniques, come from *choices* that are, to a greater extent, at all times, everywhere—even in the case of our most 'modern and rational' techniques—determined by considerations that are in no way technical (Bijker and Law 1992; Latour 1996). For want of a better expression, 'technological choices'—or technological 'options'—emphasize the sorting of possibilities on which the development of a technical system is de facto based, although usually in an unconscious and unintentional way, and they refer both to the process of
p. 302 selection and to its results. The whole problem is to identify where these choices ↳ come in; what the logic is behind them; what their consequences are; and so on (Lemonnier 1993a). 'Technical decisions' regarding the building of a metro (Latour 1996), the design of a missile guidance system (McKenzie 1990), or the fencing of gardens rather than pigs in New Guinea (Lemonnier 1993b) do not merely relate to technical actions, but to various ideas, which we label 'political', 'economic', 'gender', 'representations of beauty', etc.

The 'choices' a society adopts, rejects, or modifies in a technical component entail elements that do not serve any material purpose—such as particular ideas about gender relations between the men and women who use the finished object; representations of the relationship between a given material and the cosmos or the gods; political considerations about organizing labour, etc. Such non-technical representations weigh just as heavily as mechanical components in the way an object is thought about and manufactured (or in the way a technique is put to use), its material effectiveness, and even the fate of those who use it (e.g. Schmidt 1996).

Among the Anga people of Papua New Guinea, the use of a given type of tree bark for making capes or loincloths does not result from its affordability in a given ecological zone or specific technical knowledge. Rather, it is correlated to the use women have for this particular raw material: in those groups where women make and wear this type of beaten bark loincloth, it is literally unthinkable that men could use it. Consequently, men ignore the trees in question as a source of raw material for their own capes, using other trees instead (Lemonnier 1984; 1993a: 105–12). What is at stake is gender, and not the botanical adequacy of a raw material.

13.3 Anthropological Approaches to Technology

For years, most studies on how technology interfaces with other social behaviours have dealt either with the *effects* of technological systems on culture and society or with a search for the information human groups *communicate* when making and using artefacts. What social consequences followed the development of the steam engine, or the introduction of steel tools in 'Neolithic' New Guinean societies, or the stirrup in medieval cavalry? These are all questions illustrating this approach. At a general level, Marxist theory proposes the combination of 'productive forces' with 'social relations of production', and has resulted in the best known sociological and economic studies on the two-way interaction between the effects of techniques (and phenomena related to them) and other aspects of cultural and social organization.

p. 303 The second academic tradition comprises various studies of 'style' by archeologists and anthropologists. Style has mainly been read from artefacts through details of form and decoration as status markers (notably within social hierarchies or gendered positions), with a focus on the identities of groups and individuals, the makers or users of the artefacts.

Although there is still a tendency, primarily in archeology, to correlate stylistic details of artefacts or technical behaviour to the production of 'meaning', many anthropological case studies have demonstrated that technological options have as much bearing on physical dimensions of material culture as on 'style'. As mentioned above, *à propos* the Metro, missiles, or everyday work in a New Guinea village, the human ability to produce and freely modify technological systems goes beyond formal features that have only unimportant effects on the material world. Technological choices may deeply affect the physical 'function' of an artefact—the quotation marks remind us that style, of course, has its own function.

In the last three decades, the very embedding of techniques in other types of social actions and thoughts have been investigated under two academic labels: 'cultural technology' and 'material culture studies'. 'Cultural technology' has tried to carry on Mauss's 'utopic' (Schlanger 1991; 2006: 147) program of research by paying particular attention to the way things are made and physically used—i.e. by documenting and analysing 'operational sequences' ('chaînes opératoires'), their components, and their variations in space and time; in order to explain how particular aspects of a technical system are linked to some local characteristics of social organization, ritual life, or systems of thought. Examples of this approach can be found in case studies by Gosselain (1999; 2010), Mahias (1993; 2002), Lemonnier (1989; 1993a; 1993b), or Martinelli (1996; 2005), as well as in dozens of papers published in the journal *Techniques et culture*.

Whereas the theory of 'cultural technology' has been developed by scholars directly influenced by Mauss and by Leroi-Gourhan (1971[1943], 1973[1945], 1993[1964]), among whom are Balfet (1975; 1991) and Cresswell (1972), material culture studies result from the blending of the anthropology of consumption, initiated by Douglas (Douglas and Isherwood 1979), with an interest in the 'cultural biography of things' (Kopytoff 1986). This approach is somewhat parallel to that of Latour (2005) on the social 'agency' of objects, and is notably illustrated in the *Journal of Material Culture*. Although dealing with the 'social life of things' (Appadurai 1986), material culture studies have mostly looked at the way objects are involved in various social strategies, identity, and status issues, both in non-industrial societies in the context of modernity, and in the industrial world, often with regard to the consumption of goods (Miller 1995; 2006; Keane 2006a).

In recent years a series of scholars have successfully bridged the gap between material culture studies and cultural technology (e.g. Coupaye 2009; Damon 2008; Douny 2007; Revolon 2007). Simultaneously, attention is now paid in part to the 'embodiment' of particular aspects of local culture, via technical
p. 304 behaviour (body ↳ techniques have long been the least developed section in the anthropology of objects and techniques). Such studies show that the engagement of the self and that of the body in technical action is produced by the partial embodiment or internalization of the subjects' interactions with their cultural

environment (Ingold 2000; 2004; Warnier 2001; 2007). We are still far from the comparative studies of body techniques which Lévi-Strauss (1987[1950]: xxiii–xiv) asked for almost sixty years ago! But at least the physical engagement of the actor with the material world has now become part of the picture.

Further good news for the anthropology of technology is that real interdisciplinary cooperation is now becoming more common. The old ongoing exchanges between archeology and anthropology are now joined by disciplines such as art history, history of material culture, anthropology of art, cognitive anthropology, primatology, and philosophy which share questions with the anthropology of technology. In particular, many scholars agree to concentrate on the 'agency' or 'materiality' of objects with a growing interest in the role of objects and technical action in non-verbal communication.

Following Gell's (1998) book *Art and Agency*, the 'agency' of objects has become a fashionable idea in anthropology today. Furthermore, Gell's (1996) proposition to blur the border between art objects and utilitarian objects, as well as the unconventional usage of the word 'technology' in his paper on 'technology of enchantment' (1992), are incentives to ask crucial questions about the very nature of objects. However, as Munn (1970) remarked long ago, the idea that objects have an agency of their own is far from new—it was clearly mentioned in that seminal anthropological text, 'The Gift', by Mauss (1954[1923–3]). This 'was concerned with social relationships in which people are bound together through the agency of things and in which, therefore, the things are imbued with notions of persons' (Munn 1970: 141). In other words, to say that objects have some sort of agency is just another way to remind ourselves that material culture can be the object of anthropological investigation. Once this 'agency' is acknowledged, we are beholden to document it, by understanding the relationships tying human beings to material objects. I would add that not only artefacts but also actions on the material world in general should be studied.

By referencing Gell's work, new and good things result in the anthropology of technology, as it makes dozens of scholars ask the same series of questions about artefacts. For instance: in what respect does an 'ordinary' object differ from a seemingly similar artefact, locally considered as a piece of art (or as a ritual object, a relic, etc.)? Is there a difference in the way these various things are produced and physically used? What do people *do* with objects, including 'merely' (if one dare say) building or reinforcing social relations through the use of artefacts? What kind of efficacy do they attribute to the object: a real or imaginary physical action on the material world or an inbuilt power of its own? In what respect does an object lead
p. 305 people to act on one another? Particularly, to evoke Mauss' (1954[1923–4]), Munn's ↳ (1970), and Strathern's (1988) intuitions, how and when is an artefact considered to be a person or an extension of a person? Needless to say, this fundamental question is deeply embedded in our own conceptions of 'person' and 'object' (Keane 2006a).

'Materiality' is another fashionable catch-all term today (Miller 2005). On the one hand, it rightly leads us to ask what it means to invoke the association of social relations and shared ideas with a material object (and I would add, body technique). It also leads us to a hackneyed theme in anthropology: what does 'objectivation' mean? This adds another important question: how is the materiality of things involved in the thoughts and actions of people when they make or manipulate objects? For instance, what do people perceive of their physical characteristics or, as Keane (2006b) would put it, of their 'bundle' of qualities? On the other hand, as Ingold (2007) remarks, understanding the materiality of things implies first and foremost a description of what happens to materials when they are transformed and experienced by those who manipulate them. That is, to 'return to the messy terrain of ethnography' (Miller 2005: 41), and take seriously the 'imperative to get back to material things, and not to surrender physicality and sensuous experience to an exorbitation of language and the sign' (Thomas 1998: 108).

13.4 Two Case Studies About Objects in Non-verbal Communication

It is one thing to develop theoretical arguments pointing to the importance of the 'agency' of objects, the local ins and outs of 'materiality' or the crucial interaction of bodies with the material world. It is another thing to document these theoretical intuitions in real life, in a real human group. Now is the time for patient and detailed case studies taking into account and investigating the manner by which systems of meaning and actions on matter are organized and enmeshed in human thoughts and actions (e.g. Lemonnier 1993b; 2005; Sillar 1996).

The following ethnographic examples are illustrations of anthropological research paying close attention to making and using artefacts. I have chosen them because they both point to contemporary problems in the study of technology and fit my own interest in this field; but they should be understood as illustrating only one possible way to study technology. In particular, they present a hypothesis about a possible *unnoted* role for objects simultaneously bringing together entire series of thoughts and dealing with several (and various) aspects of the culture and social organization belonging to those who make and use them. In other words, the making and physical usage of some artefacts may be the only way people become aware of key
p. 306 aspects of a system of values and actions. Both case ↳ studies are from the Anga people of Papua New Guinea, where I started my anthropological fieldwork in 1978, notably in the study of technology.

13.4.1 A sturdy fence to build social order

The first object I will discuss is an ordinary garden fence observed among the Baruya of Papua New Guinea. Generally in New Guinea, the enclosures surrounding tuber gardens (and those containing sugar cane, bananas, etc.) result from a series of technical choices: rather than enclosing the animals and feeding them intensively, people prefer to protect their crops by enclosing the tuber gardens, while letting the animals forage freely. The women raising the animals then give them a kilo or so of tubers a day (Lemonnier 1993b).

On the whole, this method has been retained by the Anga groups, but on closer observation, several important differences can be seen from group to group. In particular, the observer who visits the valleys on foot is struck by the 'details' of technical function, which are difficult to interpret or even seem quite aberrant. In Ankave villages, for instance, it is rare and even extremely rare to see a completed garden fence, which raises doubts as to their function as garden protection. The Baruya, on the other hand, erect barriers of sharp pointed stakes regularly measuring over 1.5m (up to 2m) in height, something which can seem surprising if one knows that even hungry pigs in New Guinea are hardly noted for their jumping skills, nor do they try to break through far flimsier obstacles ('Chimbu' fences are not even lashed together) (see Fig. 13.1).

These extremely sturdy Baruya fences are as impressive as they are non-'functional'. Comprising three layers of interlaced planks tightly lashed together, they can, when maintained, firmly withstand the onslaught of any pig. My notes indicate that each running meter of fence contains over 50 boards, all painstakingly interwoven and tied together with lianas. This sturdy 'aspect' and the solidity of the oversized garden fences are the result of ten or fifteen men working together clearing a new garden in the forest. The women transport the fence stakes from old gardens in the valley, then gather and burn the underbrush, while the men—especially the garden-'owner's' brothers-in-law and co-initiates—fell trees and build the fences over the course of a week or two. As the tree trunks are turned into boards or sharpened stakes and the fence is assembled, a veritable open-air workshop is on display to the observer.

It is hard, too, not to notice that the fence is one of the occasions when male solidarity is displayed for all to see. In itself, this collective fencing effort is a reaffirmation of certain social relations, between close blood relatives, between brothers-in-law (above all), between co-initiates or between friends. The Baruya's

insatiable solidarity stands in opposition to the Ankave's determination that everyone should mind their
p. 307 own business (even if a neighbour is only a few ↳ minutes away) and to their strong penchant for long stays in the forest (Bonnemère 1996; Godelier 1986; Lemonnier 2006). When an individual garden is cleared, an Ankave man and his wife take on this forest work alone. Cooperation is almost exclusively the affair of the couple, and even then the husband and the wife carry out complementary tasks. Of course there are some contexts in which cooperation is just as intense among the Ankave as it is among the Baruya, particularly in warfare and male initiations. But for horticulture, hunting, or the manufacture of objects, the Ankave and Baruya worlds are at opposite ends of the spectrum.

Figure 13.1.

Far from being only a physical means to protect alimentary plants from the pigs, and to delimit family plots, a Baruya fence materializes and demonstrates crucial social relations: those between men and women, between male co-initiates, and between brothers-in-law.

Since no characteristic features of gestures, tools, or technical knowledge account for this disparity in the way they organize their work, it must be attributable to other domains of social reality where radically different practices are observed between different Anga groups: namely, initiations, marriage, and ways of working together. This is what a study of cultural technology is able to demonstrate.

Looking at a Baruya fence from a technological point of view—describing the artefact as well as its
p. 308 manufacture, comparing these observations with those from ↳ other Anga or New Guinea gardens fences, and placing the particular artefact and its associated technical activities into a comparative study of Anga social organizations at large—reveals that the collective effort of fencing a Baruya garden is a reaffirmation of a certain number of social relations as described earlier. In other words, these impressive ramparts against pigs are not only assigned the concrete task of establishing an impenetrable barrier between pigs and tubers. In them and through them, a whole portion of the Baruya social order is produced, with the emphasis first and foremost on cooperation but also an emphatic display of male solidarity, as a group opposed to the women. Further, there is absolute reciprocal confidence and mutual assistance of the co-initiates, and, lastly, a focus on concordance and collaboration in work between brothers-in-law, who, according to the marriage rule, have ‘exchanged’ ‘sisters’.

What is striking is that these social relations and moral rules, rendered visible and literally embodied by the participants, are precisely those features setting the Northern Anga, Baruya, and also Sambia (Godelier 1986; Herdt 1981) radically apart from their neighbours in the south or the southwest, who in turn are characterized by a spectacularly low level of cooperation. Thus, a garden fence is a way to evoke a series of institutions, actions, and social representations in a non-verbal way.

In this first example, the aspects of a culture are demonstrated in a technical activity. The actual construction of the fence and its mechanical as well as visual sturdiness are often explicitly emphasized in various circumstances: in discourses during male initiations or inside the men's house; each time brothers-in-law comment on their good or bad relationship; each time women are scolded by men. By contrast, in the following case study it is hypothesized that the manufacture and use of the artefact in question is a way to evoke aspects of culture that may not be verbalized. The artefact, a mortuary hand-drum, is used by another Anga group, the Ankave, who live five to seven days' walk away from the Baruya.

13.4.2 A drum that does far more than produce sounds

About once a year, the Ankave, a small group of forest horticulturalists, drive away (completely, they believe), the marauding ghosts of those who have recently died (*pisingen siwi*), during a ceremony called *songen*, named after the drums which are beaten for several nights in a row. These drums look like hourglasses, made of two long, tapered cones joined at the tips and sometimes surmounted by a handle (Bonnemère and Lemonnier 2007: 192–204; see Fig. 13.2).

These *songen* ceremonies are the most visible part of a thought system revolving around vile, man-eating beings, invisible and deeply hostile to humans, known as *ombo'*, which the Ankave hold responsible for most fatal illnesses. The *ombo'* make up a band of invisible cannibals hosted inside seemingly ordinary
p. 309 human beings. ↳ The *ombo'* attack, devour, and share between them men, women, and children who are believed to have refused to share things themselves. The obligation to acquiesce to all requests for food or objects is a pillar of Ankave social order of which the *ombo'* are a constant reminder.

Figure 13.2.

Among the Ankave, making and beating the drums that funnel the spirits of the recent dead into another world amalgamates myth, technique, and ritual, and results in the non-verbal communication of a series of key values and aspects of their social organization and system of thought.

According to the Ankave mythology, it is the *ombo'* that humans also have to thank for the *songen* ceremonies, as well as for the masks worn by the drummers and the songs sung during the drumming. It is they who, from the depths of a pond, brought humans the hourglass drums, beaten night after night when it is time to definitively despatch a *pisingen siwi* spirit, and to forget the deceased to whom the ghost belonged. The origin myth of the drums also contains an extraordinary spoken operational sequence, providing a step-by-step explanation of how to make the instrument while underscoring the key aspects of the imaginary device whereby the Ankave dispose of their dead: the origin of the drum skin, made from the skin of a snake-man; and the importance of the 'throat' or middle part of the object (Lemonnier 2005).

The myths also explain that the *ombo'* make endless circuits to the sound of the drumbeat, after men have
p. 310 kept them chained up night after night in our world. ↳ The hourglass drum plays a crucial role in dismissing the spirits of those who have died recently. Drawn in by the arms of the *nowimboxo* mask, the *pisingen siwi* spirit is driven towards the other world by the racket produced by the drum skin, the selfsame din that resounded on either side of the water when the Ankave ancestor discovered this wonderful object. At this point, the spirit of the deceased travels through the two pieces of the instrument. The myths recounting the origin of the *songen* ceremonies have much to say about this: the narrow piece that connects the two chambers of the drum and the python-skin membrane which acts as a gateway to eternity. In other words, an Ankave mortuary hourglass drum is not only a musical instrument, it is primarily a funnel-shaped psychopomp, that is to say the narrow canal whereby the ghost travels from the world of the living to that of the *ombo'*.

Shamans say that these cannibal monsters feed on corpses, killing their victims by inserting objects into their veins or by cutting them, as well as by slashing their liver. Those Ankave people who have had the horrible surprise of identifying an *ombo'* have recognized maternal kinsmen who looked exactly like their uncles or cousins, except for their red eyes and dog-like ears. For the Ankave, a foetus is believed to feed on maternal blood, and everyone agrees that a brother has given to his sister's children the life-giving blood he shares with her. This is one reason why maternal kin always claim they have not received enough gifts to compensate the birth of children who are 'one blood' with them. In the Ankave world-view there is no way to compensate for the blood-life one receives from his maternal kin. And this is the reason why the *ombo'* are like mothers who eat their own children.

But this is not yet the end of the story, as revealed by a contextualizing anthropology of technology. An Ankave mortuary drum is more than a double funnel linking the two sides of the same entity—the Ankave society—with its living and its dead. On the one hand, this artefact does what art or 'images' do, according to various anthropologists. For Wagner, '[a]n image has the power of synthesis: it condenses whole realms of possible ideas and interpretations and allows complex relationships to be perceived and grasped in an instant…the power of eliciting [causing to perceive] all sorts of meanings in those who use and hear it' (Wagner 1987: 56).On the other hand, an Ankave drum is neither a piece of art nor merely an image.

To understand an object according to the theory and methods of the anthropology of techniques, one has to consider it within the full complexity of the operational sequences in which it appears, as well as in the systems of thought that refer to it. In the present case, if one considers the drum together with the night ceremony, *and* with the making of the drums, *and* with the operational sequence given in myths, one realizes that it is not the object alone that has what Gell (1996: 37) called 'objectification of complex intentionalities'.

In my view, while using the drums the Ankave are mixing together thoughts and actions belonging to
p. 311 various domains of Ankave culture, social organization, and ↳ imagination. Collectively beating the drums is a unique way of putting together myth, ritual action, and material actions, by doing things, and not by simply looking at them (as for an image) or talking about them (as when evaluating art objects). It is because of the drums on which they are focused, and through the material actions by which they are

fabricated and used, through contact with the matter—making the drums, beating the drums, singing, waving the 'hands' of the masks, walking in line for hours—that various aspects of Ankave social life are made present to the minds of the participants. These various domains of social action are: the ambiguity of maternal uncles (both cherishing and devouring); the reason shamans have to treat the *ombo''*s victims and the physical damages to the latter's innards; the necessity of performing *songen* ceremonies to manage mourning; the local representation of life and the overwhelming importance of maternal blood; the origin of the drums, etc.

With regard to the general 'message', 'meaning', or 'social value' that is common to these various instances of social life, these domains are redundant, for they all refer to the idea that you will never be able to repay 'the life your maternal kin gives you, thus, the maternal kin will take it back in the guise of the cannibal *ombo''*s involvement in mortuary procedures', say the Ankave. It is this same message that is spoken, illustrated, and put into objects and actions in various ways. The drums themselves, making the drums, and thinking about the drums, as well as beating the drums in general, all signal in a non-verbal way the reasons why and when these domains have to be evoked together—when the *ombo'* recapture the life they have given. It is a reminder that some artefacts, ideas, social hierarchies, narratives and gestures have to be thought together. And, most importantly, it evokes the very reasons why they have to be linked.

The difference with the case of the Baruya fence is that the meaning brought to the minds of the participant of a *songen* ceremony cannot be put in words. This particular technical device, a drum used in a ritual context, illustrates these 'implicit non-verbal statements', 'unspeakable truths', as well as the 'blurring of boundaries' (between the living and the dead) that Tuzin (2002) linked with the 'crafting of an illusion' in art objects.

It is worth pointing out that I have not merely hypothesized a vague 'agency' of drums in Ankave culture. Rather, I have explained what that agency is about, and how it works. Also, rather than adding more vehement paragraphs on the necessity of burying all dualisms—nature/culture, spiritual/material, style/function—I have documented two ethnographic cases, paying attention to the actual physical making and using of things in the embedding of meaning and physical actions.

Regarding the two Anga examples above, the new questions that arise are: what are the differences between an art object, a ritual object such as an Ankave drum, and a non-ritual and non-art object like a Baruya fence?
p. 312 The answers to these questions would be established only by careful observation, description, and ↳ analyses of artefacts and technical behaviour comprising their whole social context, in the widest sense; and linguistics has a key role to play here.

13.5 Linguistics and Technology: Field Questions and Methods

Besides reflections on the links between the evolution of human ability to develop technical actions on the material world and the origin of language (Leroi-Gourhan 1993[1964]; Ingold 1999), the theoretical relationships between technique and speech that have been studied take several forms, all related to the various ways techniques and objects are associated with 'meaning' or, more generally, some kind of information. But these relationships between linguistics and the anthropological study of technology are paradoxically poorly developed. On the one hand, it is obvious that no technical action can be understood as part of a global social system without paying utmost attention to hours of spontaneous speech or comments on that action; on the other hand, field studies linking the two fields of research are in fact extremely rare.

With the exception of vague and superficial propositions, considering technical actions on matter as some sort of speech, i.e. using language as an analogy to understand some aspects of techniques, has given poor results. For instance, Baudrillard's mention of weird elementary 'technèmes', the combination of which was

supposed to characterize artefacts and machines (Baudrillard 1968: 12–13), led nowhere. A technical action (*chaine opératoire*) is not a 'sentence' in which a combination of operations, matter, and actors following some kind of 'grammar' would result in a modification in the material world that, in turn, could be glossed as the 'meaning' of that technical action. More efficiently, most studies have concentrated on the information that techniques and artefacts contain and convey. This information—or 'meaning'—has to be understood both from a wide etic point of view (what do techniques, in their most physical form do in social relationships?) and from an emic point of view (for the people who make and use them, artefacts are markers of some identity; artefacts are inscribed with some information; etc.).

A good reason for this failure to apply some kind of semiotic theory to technical processes derives from the complex aspects of that information and processing that constitute what anthropologists call 'tacit (or implicit) knowledge'. As Bloch (1998: 11) stated, after showing that the operations needed to drive a car 'not only *are* not linguistic but also *must* be non-linguistic if they are to be efficient'. The automation of gestures and mental operations (e.g. what you do in order to overtake another car) that result from a long process of
p. 313 apprenticeship implies that the actors are not ↳ (or no longer) conscious of them, and this indirectly makes it hard for the anthropologist trying to grasp them (Mahias 2002: 97–108). Any comment by the actor is welcome, for it may help understand what kind of phenomena are involved, together with the words used to describe the elements put together in a technical process. A good example is Delaporte's (2002) work on the 'herder's eye' in which he explains how Sami herders are able to grasp, in one glance, a set of information which allows them to recognize one particular animal in a herd of several hundred.

From the point of view of the social scientist, by distinguishing one artefact from another by its form, decoration, or characteristics of fabrication, i.e. by studying its 'style', one is able to make hypotheses on the homogeneity, particularities, and inscription in a historical or regional setting of the group of people who produced or used them. As mentioned earlier, this approach is the first step of most archeological research. In anthropology, the deciphering of style has been mostly limited to the marking of identity, following two researchers whose work was influenced by linguistic theory: Bogatyrev (1971[1937]), for whom the folk costume of Moravian Slovakia was a 'sign', and Wobst, who studied the components of the Yugoslav costume as pieces in a process of information exchange (Wobst 1977: 321). Delaporte's work (1988), which is also on costume (that of the Sami), is among the very few studies that envisage the functioning of such a system of signs to identify which are the units used to produce meaning, or what is the nature of the 'meaning' thus produced.

The recent and promising trend in research on technology explores the multiple and diverse manners in which the very materiality of objects and technical actions are part of a system of thought, social relations, and actions. However, a linguistic approach to artefacts *in the making* is extremely rare. Not surprisingly, it was developed by French scholars who were more or less influenced by Haudricourt (1988), who was both a linguist and 'technologue', and by Leroi-Gourhan and his students. In case studies on weaving (Lefébure 1978; Drettas 1980) or the domestic kneading of dough (Virolle-Souibès 1989), a painstaking recording and description of the vocabulary associated with a given technique, as well as a study of the connotations of the terms (their semantic field), allows us to grasp some links between technical acts, what people say about them, and the various activities, symbolic or not, relating to the activity as a whole and to its components.

As we have seen in the Anga cases studies above, some techniques, such as the making of a Baruya garden fence, may be a way to repeat and make tangible some essential aspects of a social system, institutions, shared representations, etc. Others, such as the Ankave mortuary drum and ceremony, evoke and gather aspects of a culture, social organization, and system of thought that may not be verbalized. But these non-verbal ways to evoke key sets of relations (or values) of a given human group cannot be discovered without careful attention to whatever words are uttered about these relations as well as technical actions. If one does
p. 314 not listen to ↳ Baruya men boasting about male cooperation, or to Baruya brothers-in-law having a row because they did not do some work that they should have, there is no way to realize that making a fence is

more than making a fence. Similarly, without the words that tell the origin myth of the Ankave drum, or the words that describe the parts of the drum (notably its middle, or ‘throat’, that swallows the spirits of the recent dead), I have would have had no clue to the complexity of what is going on when people make or beat drums.

13.6 Collecting Linguistic Data on Techniques

The collection and analysis of the vocabulary is of crucial importance here: its signification and connotations may reveal links between the technical domain and other domains, as clues to the way the processes in question are represented. As Lefébure (1983) warned, this does not mean that the linguistic structure of the speech about a technique may reveal a concealed technical structure of sorts. But the words in question may reveal how a technical action, its elements, and its social context are represented.

The words to be recorded in the field are those used to qualify the elements of the operational sequences: the matter being transformed, the names of its different states, and particularities of these states according to the actors; the tools and their components, the parts which are named and those which are not; the gestures; the energies; the actors, including the invisible powers at hand—if any. Operations might have their own names, as also might the different steps in a given operation. For example, by noting the phonetic proximity between the name for ‘blood clot’ and that for a given state of the liquid paste in question, Bonnemère's (1998: 116) study of the preparation of red pandanus fruit's juice is a clue to the fundamental equation made by the Ankave-Anga between that culinary preparation and human blood. There may be also local names for ‘know-how’, ‘skills’, ‘specialists’, etc.

At first, one is overwhelmed by what has to be observed, understood, and recorded with the greatest detail possible in order to be able to understand and explain what is going on in a particular technique observed in a given place at a certain time. In other words, the anthropologist must find some way to be able to see and record which are the gestures, tools, and material put together during each step of an operational sequence. What is the energy used? Who are the actors (and the bystanders)? Are there any comments? What is the duration of each operation? Are these operations named? This is the only way to be able to discover and
p. 315 understand what are the local characteristics of a technique in a particular society. ↳ The more precise the description, the better. Fortunately, modern technologies are of great help to record most of these data.

As explained elsewhere (Lemonnier 1992: 27–30), technical actions are often repetitive, which gives the observer some chance to grasp the characteristics of a given operational sequence. Video recording is an easy way to document technical actions, as long as the researcher remains extremely attentive to what is going on. Back home, it will be too late to ask questions about the action that has been filmed. A good description entails some ability to manipulate simultaneously a pencil, two cameras (photo and video), a stopwatch, and a tape recorder. With some training, this is quite easy. Exhausting, but easy. (See also Margetts and Margetts, Chapter 1 above.)

If possible, one should consider that one description of a given technical sequence is not enough, for the good reason that most of the questions that come to the observer's mind result from differences s/he has noticed between seemingly similar operations. Documenting all sorts of variants is essential here. From one day to another, the same agent may work differently. Two actors may have their own way of doing things, and so on. Observing the same series of technical actions (house-building, basket-making, cooking food, and tens of other mundane or less mundane technical actions), between two neighbouring groups—whatever ‘group’ means in a given situation—is quite rewarding.

Participant observation deserves a special mention here, for it is not only a way to share people's life and activities; it is also a way to grasp aspects of a technical process that would otherwise escape the

anthropologist's observation or the actor's comments. One does not need to be a good potter to describe pottery, but some kind of apprenticeship can be a useful tool in understanding technical processes, allowing the formulation of specific questions. This also gives access to the implicit knowledge mentioned above.

It is important for documenting technical activities and their links to other social spheres of activity to collect descriptions (plural!) of technical activities, including comments at the particular moment of that activity. More generally, it is interesting to know what part of a technical activity is verbalized, never mentioned, or is forbidden to be mentioned. Besides the identification of variants—which really constitute the bulk of the data analysed—the identification of 'strategic operations' (Lemonnier 1992: 21–4) is of importance. These are particular actions or steps in an operational sequence that cannot be delayed or profoundly modified without jeopardizing the whole process at hand. It is interesting to know both what operations are considered to be 'strategic' and how those operations that are crucial from a physical point of view are dealt with. This is of course where technical specialists and social hierarchies may enter the picture.

Neither the objects nor the physical actions of the actors manipulating them say things plainly about the 'meanings' in question, particularly when artefacts lack any decoration. To have people describe in their
p. 316 own words what they are doing is ↳ of utmost importance because, on the one hand, they show their personal organization strategies for an operational sequence, and, on the other, they may both emphasize or refrain from commenting particular aspects of the technique (or object) in question.

Therefore, it is only by listening to what people say about these artefacts and technical activities, as well as what they say in any of the activities which are related to them in some way or another, that it is possible to grasp the complex insertion of technical behaviour within various other social logics, including their role in non-verbal communication. Together with a precise understanding of the physical (mechanical etc.) aspects of an artefact, linguistics is a way to enquire into the 'bundle' of qualities (Keane 2006b) within an object which are ready to be 'chosen' by members of a given culture, either to act on the matter in a given way and with a certain efficacy, or to include this artefact or material in a particular system of meaning and/or social relations.

For instance, when the Ankave-Anga of Papua New Guinea use a given plant (cordylines) as fences, territory markers, and key element of sacred sites, they elaborate on one of the inherent qualities of that particular plant, which is its vegetative reproduction. It is plausible that the cordylines used today are the clones of those that grew on an ancestral spot, according to myth. The perception of a particular characteristic of the plant therefore reinforces the veracity of the myth as well as the social efficacy of the artefacts made with the plant.

It is hardly necessary to remark that, in the present state of the anthropology of techniques and objects, no particular approach is more appropriate than another in understanding what people exactly 'do' when they act on the material world. The main challenge, now, is to understand how the phenomena addressed by the various possible approaches are, indeed, linked together within a technical action. Paying attention to the way people 'tell' their techniques is an essential part of this program.