Logotypes, tattoos, drawings, maps, musical scores, figures, graphs, writing, numerals, hallmarks, and signatures all these forms of external representation are part of our daily landscape and permeate most social activities from the moment we are born. In western societies the first institutional act is a representational one, parents inscribe the name of their child in the civil registry office. The means “we use to present and re-present our thoughts to ourselves and to others, to create and communicate records across space and time, and to support reasoning and computation, constitute a central part of any civilization’s infrastructure” (Kaput, Noss and Hoyles, 2002). This book is about humans’ creation, appropriation, understanding and use of external representations.

External representations may look very different; consider, for example, how different the map of your country and its written title look in their graphics. They may also refer to a diversity of domains; drawings might depict the shape and color of objects, musical scores denote tunes, writing represent language and tattoos might denote tribal identity.

Some kinds of external representation have become highly conventionalized, they form systems with clear boundaries in which new elements are hardly if ever accepted and in which combinations are regulated by rules and norms, others are unique creations or ad hoc inventions to solve a particular problem or represent a particular content. Conventionalized external representations use a limited set of elements of distinctive form which are recognizable despite the alterations different users may introduce in their appearance (e.g, an alphabet). It is in conventionalized notation where the distinction between actual realizations and conceptual categories becomes crucial. This distinction termed inscriptions and characters by Goodman (1976) is crucial because it enables users of notations to recognize the same despite the different. Strictly speaking the term ‘notation’ should be reserved to conventionalized external representations.

In spite of the differences in graphic features, domain of reference and degree of conventionality, external representations share three crucial features. First, they all have a “double face” (Sebeok, 1996, p. 34); they are what they are; yet, at the same time, they evoke something beyond them. Numerals are ink or graphite on paper or chalk on a blackboard but they can be used to refer to discrete quantities. Having a “double face” is common to every symbolic object – this is the sine qua non condition of a symbol.1
This duality was turned into a triad by Pierce (1935–1966) who included the interpreter in the notion of symbol and brings about the second feature shared by external representations: intentionality. Representations do not stem spontaneously, they are produced by human agents intentionally. Intentionality is always true for production; but, it is not always true for interpretation. External representations must be intentionally produced for symbolizing whatever they symbolize, but a graphic shape or a numeral may evoke a particular person or event to an occasional interpreter. Any object must be created as a representational object in order to be symbolic but any object can be turned into a symbol in the act of interpretation.

Another feature that external representation share is that they have physical/material permanence, they are not ephemeral. This feature clearly distinguishes external representation from spoken language and sign language because their expression is fluent and does not last for off-line examination, unless of course it is recorded. This feature also separates external representations from any form of internal representation or concepts, the subject matter of cognitive psychology. Although a dialectical interaction is supposed between internal and external representations (Tolchinsky, 2003).

These three features: double face, deliberateness, endurance enable a peculiar kind of interaction with this kind of objects. We can produce them and look at what we are producing in the very process of production (Willats, 1985). The results of movements can be monitored, contemplated, and adjusted while they are still being produced, immediately after production and much later on. This kind of interaction explains why lasting and deliberate representations can be turned into a problem-space, not only after being completed, but also while they are produced.

Lasting and deliberately created representations can be separated from the producer and from the situation of production; they become detached from the process, the context of production and the time during which they were produced (Lee & Karmiloff-Smith, 1996). However, the producer, the context, the process, and the moment of production, all these aspects, somehow become embedded in the product so that this product means in the absence of the producer and in a different context and time.

These three features make of external representation a multifunctional kind of object. They function as communicative referential tool encoding a diversity of contents and being used in many different activities. From buying and selling to the most holy rituals, most social acts involve the creation and interpretation of external representations. Besides communicative referential tools, external representations are also epistemic tools, objects to think with. We can perform the same mental actions or linguistic activities online or off-line. The perspectives from which these actions are performed are multiplied when the same person is both the producer and the interpreter or when the situation is repeated at different times and spaces, individually or in groups. That is, external representations multiply our cognitive exercising under changing perspectives.