TOWARDS THE USE OF QUANTITATIVE ANALYSIS IN MESOPOTAMIAN SPHRAGISTICS[1]

1. GOALS AND PRESUPPOSITIONS

Cylinder seals and seal impressions constitute a continuous record of the changing pictorial style in Mesopotamia from the Uruk period on. The record has been clarified for us especially by the major works of FRANKFORT (1939), MOORTGAT (1940), and PORADA (1948). Individual periods have also been studied such as the Akkadian seals (BOEHMER 1965) or those from the Middle Assyrian period (MOORTGAT 1941 and BERAN 1957). In studying these seals, problems concerning the range of iconographic motifs or the stylistic and chronological development have been stressed (eg. AMIET 1961; KANTOR 1966). Historical problems have also been investigated through the use of seals on tablets (PORADA-LAMPL 1962). These studies among others have concentrated on specific corpora or specific periods. As in all such cases, the choice of a corpus or period is conditioned by such factors as the nature of the material or its availability. Ironically, the very fact that for many periods seals and seal impressions are available in very large quan-

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[1] No such general term has come to be commonly in use in our discipline because the trend of the research has so far been toward the publication of individual items or corpora and the analysis of specific points of interest. As one strives toward a more systematic approach to the field of seals and sealings, the need for a general term becomes apparent. The one choosen here, sphragistics, is used to refer to the study of seals in general, i.e. stamp and cylinder seals, including the impressions of these seals on other objects (tablets, bullae, etc.). The term « sigillography », on the other hand, besides exhibiting an akward etymological mixture of Greek and Latin derivations, focuses more specifically on seals at the exclusion of sealings or the act of sealing. I wish to thank Marie-Thérèse Barrelet, Edith Porada and Maurits Van Loon for reading the manuscript and giving me their valuable comments. Since the manuscript was completed, several pertinent books and articles have appeared which could no longer be utilized, see especially DIGARD 1976; PORADA 1976; GIBSON-BIGGS 1977.

tities seems to have hampered at times their investigation. And yet it is
precisely because of the availability of large numbers of seals that a more
thorough analysis is called for, namely one based on a quantitative approach
(see KELLY-BUCCELLATI and ELSTER 1973: 199-200; a similar project using
a more restricted corpus with less complicated design motifs has worked
out some of the methodological problems encountered in this type of rese-
arch, DETHLEFSEN and DEETZ 1966). This approach moreover should seek
to minimize as much as possible subjective evaluations in analyzing seals
and imprints. This can only be done through a formal analysis based on a
rigorous application of a precise attribute system. Even so, some degree
of subjectivity remains unavoidable, but in a well articulated attribute
system there is at least the advantage that the « reading » of the object is
based on a system of mutually exlusive identifiers which spell out very
clearly both the generic and the specific traits of any given artifact. The
binary logic which underlies an encoding of this type is especially likely
to result in a system whose component parts are truly mutually exclusive
and hence truly comprehensive. The alternative (and traditional) mode
is to compile a conglomerate of observations, which are purely cumulative,
one with respect to the other, and form an *open* system. Instead, with an
attribute system based on binary logic we obtain an integrated structure,
whose component parts are logically interrelated and form a *closed* system.
In this sense we may say that the current anthropological terminology which
distinguishes between -etic and -emic levels of analysis may be understood
as referring respectively to a cumulative and open system (« -etic ») or to
a structural and closed system (« -emic »). The attribute analysis which
I am describing here is precisely a contribution toward the development
of such a structural system for a comprehensive analytical reading of the
seals, on which alone a true quantitative analysis of automatic attribute
identification may become possible (e.g. through applications in photo-
grammetry), progressively minimizing the subjective dimension in the anal-
ysis. At this time, our starting point can only consist of photographs and/or
hand copies. Especially the hand copies, which are so necessary for the roll-
ings, are subject to a considerable amount of interpretation. In order to
eliminate this in the future it is necessary to develop a technology capable
of reproducing accurately and faithfully the design, possibly through photo-
grammetry or a similar process. Through such more precise means we will
then be able to determine very fine stylistic idiosyncracies which result not
from a conscious effort on the part of the seal carver, but rather from motor
habits which are impossible to reproduce consciously and thus are a sure
indication of a single person as maker. It is only through these means that
we can finally separate the work of individual artists on a more secure basis.

A great deal of work in other areas has already been done on this type of methodology (DE GARMO 1974).

Another aspect of the seals, besides the sheer bulk of the inventory, enhances their usefulness as a research tool: they are often rolled on tablets which are dated, and this usually gives us a reliable chronological basis for determining their development. In addition, seals of important persons such as kings and royal wives can be dated from other sources. Moortgat used both these dated sources in his study of the seals in the Berlin Museum to outline the chronogical development of the Old Babylonian seals (MOORTGAT 1940: 32-34).

Thus the seals are a unique vehicle for a combined research utilizing iconographic, stylistic, and textual evidence from a quantitative point of view. Specifically, this body of knowledge is a unique source in reconstructing cultural changes both through time and space. The major factors which are operative in terms of such a space-time distribution are as follows:

1) Although seal designs are in general uniform during one period in a given area of Mesopotamia, variations in composition, iconography, etc. do play a significant role throughout any single period.

2) The diachronic distribution of these variations (even within the same general period) can be documented precisely through those seal impressions which are found on dated tablets.

3) The same diachronic distribution can further be documented when design motifs are found associated with historical events and social conditions which can be determined through textual evidence.

4) The spatial distribution of these variations can be documented in those cases where the provenience is known.

5) The social distribution of these variations can be documented precisely for those seals for which the profession of the seal owner is stated. This then is of course also true for the economic role of the seal owner.

This type of evidence makes it possible to ask a whole set of questions, which are important not only in themselves but also because of their ramifications. First are questions dealing with time and space distribution. Where did design changes originate? To a large extent the seal cutter was conditioned by the designs and compositions of the previous periods. These constraints however were a restriction only up to a certain point; in all major periods new motifs, combinations of motifs, and compositions were continually being introduced. In addition, designs evolved during the course of time so that their evolution can be traced. In the Old Babylonian period, for instance, did changes in seal iconography start in the capital and radiate

out from there in the measure in which its conquests extended the range of
its political control? What is the time depth for each spread; how long did
it take for new elements to spread from the city of origin to other cities?
Can the rate of spread be correlated with the importance of the place of
origin, the geographic proximity to the place of origin, or any other factor?
Also can we see a correlation between changes in style and the political
fortunes of a city? For instance, do the seals used at Larsa change after its
conquest by Hammurapi and if so do these changes reflect a style then com-
mon in Babylon itself?

Then there are questions dealing with social stratification and economic
relationships. Did certain changes originate in the seals of a special social
class or group? Can we see social changes such as the rise of certain non-
Akkadian ethnic groups through the use of their seals? Can we determine
administrative or economic relationships through the seals, e.g. through a
correlation of the use of various seals by a single official and the documents
they are imprinted on, can we see more precisely his function?

Other questions deal with broader issues such as religion or symbolism.
In general, can we associate changes in seals with changes in the surrounding
culture which produced them? For instance can we associate certain icono-
graphic motifs with the gods named on the inscribed seals, and if so what
significance can this have for popular religious beliefs during the period?

In the study of cylinder seals there are certain methodological assump-
tions which can be made. First, the seal cutters are assumed to be full-time
specialists engaged primarily in the carving of seals — whether or not they
also carved the inscriptions on the seals, which in most cases seems unlikely
(see LAMBERT 1975: 220-21). This is not to say that the seal cutter could
not have on occasion also worked on larger monuments, but this would have
been the exception rather than the rule. Second, it is assumed that the seal
cutters were generally working in one localized area, such as a town or city,
and were not itinerant craftsmen, since no evidence for itinerant craftsmen
in this profession has been pointed out so far. Their clients were normally
people from such a town or city and the area surrounding it, although natur-
ally in a complex society such as urban Mesopotamia, there could have been
a number of exceptions. Third, the seal cutters participate in a wider de-
corative and stylistic tradition than just that of their immediate surround-
ings, in other words there was a widely spread design tradition throughout
Babylonia and to some extent throughout Mesopotamia. This, however,
does not exclude there being an interaction with peripheral cultures; in fact
we have evidence of a Syrian influence on Old Babylonian seals used at Sippar
(PORADA 1957; PORADA 1962: 108-09). The presence of an overall tradition
does not obviously exclude internal variations of the broader regional scope

(especially between northern and southern Babylonia) and more narrowly on the level of individual cities (see PORADA 1962: 109-111).

2. THE STYLISTIC AND ICONOGRAPHIC ANALYSIS OF MESOPOTAMIAN SEALS PROJECT: CURRENT STATUS [2]

With all this in mind a project was started two years ago to analyze Mesopotamian seals from a stylistic and iconographic point of view. The project was initiated with the study of Old Babylonian seals because of the large numbers of items in that particular corpus and because they are found on many dated tablets. A comprehensive attribute system which covers the whole range of iconographic and to some extent stylistic variations has been worked out for this period. It is in the nature of such attribute systems that they are tested through repeated use against the corpus, and revised accordingly; as more and more data are processed, the attribute system articulates and defines individual features in themselves as well as in terms of possible correlations with all other features. These features include details of composition, iconography, style, and inscription, if present (see Figure 1).

The first major distinction is between levels of analysis, depending on whether the mode is *internal* to a stylistic and iconographic system, or *external* to it. In turn, external criteria are either *context-bound*, i. e. relative to a set of specific reference points of time, place, availability, etc. in the past or the present, or *context-free*, i.e. determined with reference to absolute scales of measurement (size, physical composition, etc.) or to qualifiable scales of workmanship (mode of attachment, technique of carving, etc.).

The *internal* criteria are either epigraphic or anepigraphic (figurative). The *epigraphic* data may be divided in terms of the degrees or specificity of the information. The most individualizing of the specific data are names, which refer to unique individual entities; second to these are qualifications (of profession, occupation, reciprocal relationship within a hierarchy, etc); less specific information contained in the seal legends is omitted from the present version of the system.

The *figurative* data are first divided in terms of whether the component

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parts are considered in themselves or in their interrelationships. In the latter case we are dealing with an integrated *whole*, which may in turn consist of either a single composition, or a complex of compositions. In either case, the categorization has to do with number, pattern, nature, etc. of the compositional elements. As for individual *parts* within the whole, the main distinction is one of rank: depending on quantifiable criteria based on relative size, some figurative elements are considered as « principal » (traditionally, these are figures which are easily recognizable) while others are considered as « adjunct » to the principal figures and are not in contact with them (they are usually termed « filler motifs »). Figures are described in terms of formal (e.g. posture or dress) vs. notational categories (eg. the attitude or role of the figure, or its general nature — whether a man, a god, an animal or the like). Those features which are not formally a part of the figure (as the dress would be) but are closely linked with it, as formally indicated by their being in contact with the figure, are treated separately as « contact features » (e.g. a chair on which the god sits, etc.). Thus when all the analysis is finished every figure and object on the seal has been described in full and located both horizontally and vertically (for a different approach see GARDIN 1967).

A thorough analysis of such a large body of complicated material can only be conceived as a team project. At present the following individuals have worked as part of our team: Bonnie Boehme, Arlene Harris, Peggy Pollinger, Eunice Saver, Stephanie Serlin and Vita Tannenbaum. They are divided into subteams, each one of which is responsible for a certain group of seals and performs the initial analysis and encoding. This first analysis is checked by a different team; another check is done by the writer as project director. Constant feedback and interchange of ideas among the teams and the director is accomplished through regular group meetings. In addition to attribute analysis on cards, another file with a photograph of each seal is kept.

At this point, the encoding is in the process of being formalized for the sake of computer analysis. The empirical work conducted on the seals studied so far, coupled with a concern for the universal nature of the logical system of categorization, will result, it is hoped, in a taxonomic code that is both flexible and structurally comprehensive. The conceptual analysis has been already performed in detail on the corpus defined above. The next step is to translate the data into machine readable form; this will be done in the near future. Finally, the data will be submitted to various programs especially written for our project (and partly already available within the framework of the wider Computer Aided Analysis of Mesopotamian Materials Project, mentioned above): these programs will articulate the syntax of the features entered as input, and provide various types of concordances, fre-

quency computations and statistical analysis, in addition to a basic question and answer function as with any similar data bank.

At this point a total of several hundred seals has been completely analyzed. These come from various publications including MOORTGAT (1940), VAN BUREN (1940), PORADA (1948), PARROT (1954), FRANKFORT (1955), RAVN (1960), BUCHANAN (1966), and VOLLENWEIDER (1967). The present consistency of the data base is accidental since ours is an ongoing project with the immediate goal in mind of completing the analysis of all published Old Babylonian seals. However even with this incomplete corpus certain interesting patterns are emerging. To one such pattern, which will serve as a case study, I wish to devote the rest of this article.

3. THE GODS AND THEIR SYMBOLS — FIGURATIVE AND EPIGRAPHIC COR-RELATIONS

One of the aspects of the project, as is clear from the above, is to compare the seal inscription with the iconography of the seal. In our corpus we have analyzed 218 seals with inscriptions containing divine names [3]. With this data, however incomplete, it is possible to see a trend in connecting the gods named in the inscription with the figures shown pictorially on the seals [4]. Previous writers on the subject arrived at a negative conclusion, i.e. they maintained that the iconographic motifs are connected with the gods named only rarely. In his classic study of Mesopotamian cylinder seals, Henri Frankfort concluded that in the Old Babylonian period (as in earlier periods) the names of the gods in the seal legends did not correspond to the gods represented on the seals [5].

While we have not completed the analysis of all the Old Babylonian inscribed seals, the preliminary results show that the contrary is true, namely that there often is a correspondence between the god named in the inscription and the motifs shown. The inscribed seals used for this preliminary analysis were only those with one divine name in the inscription and one divinity pictured on the seal; this eliminated the need to assign motifs to any god before the connection with a certain symbol or set of symbols was estab-

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[3] These seals are from the collections published by MOORTGAT (1940), VAN BUREN (1940), PORADA (1948), FRANKFORT (1955), and BUCHANAN (1966).

[4] It was Professor Jacobsen, to whom these pages are dedicated, who suggested we take up this question again.

[5] FRANKFORT (1939: 11-12). See PORADA and BASMACHI (1951) for a case where they do coincide.

lished. There are two exceptions to this: those seals containing the names of Šamaš and his consort Aya and those naming Adad and Šala were included in the motifs connected with either Šamaš or Adad respectively. We do not so far have enough seals with only the names of Aya or Šala to test whether or not this assumption is valid [6]. From the scarcity of seals in general naming the consorts independently and their known connection with these male gods, it seems likely that the motifs can be associated with the male gods.

After these ambiguous seals were eliminated the corpus contained 181 seals. Of these 106 seals (58 %) contained the names of the following gods: Šamaš 46 (25 % based on the total of 181), Amurrum 23 (13 %), Adad 21 (11 %), and the deity Ninšubur 16 (9 %). In the case of Amurrum his name is written MAR.TU, AN. MAR.TU, or AN.AN. MAR.TU; these are all included under the name Amurrum here [7].

The iconographic motifs on the seals are divided into two major categories: contact and non-contact features. Both these types of features were tabulated for all four gods. The numerically significant motifs are shown on fig. 2. It is clear from this figure that Šamaš is the most frequently mentioned god in the seal inscriptions. This fact is interesting in itself because this corpus is in effect a random sample of the known types of Old Babylonian inscribed seals. Very few come from known proveniences and all are now found in various museums throughout the world; they also can be stylistically attributed to various times within the Old Babylonian period. On the basis of the Sippar corpus available to her, Porada thought that perhaps the seals from Sippar may have more representations of Šamaš while those from Larsa show the war goddess in greater numbers (PORADA-LAMPL 1962: 109). From our evidence here it appears that Šamaš is indeed more popular in general in the Old Babylonian period no matter what the seal's chronological place within this period or where it was carved. This however must be reexamined when all the seals have been completed. The god on the seals with the name Šamaš is frequently shown holding a saw (24 %) or a cup (24 %) with his foot raised on a mountain or stool (20 %). The non-contact motifs which are found on the seals mentioning Šamaš are the crescent (46 %), with the variations of the crescent amounting to 9 %. Also frequently occurring is the ball staff 33 % and vessel 35 % with the combination of ball staff and vessel amounting to 26 % of the seals containing the name of Šamaš. Among the animals the mongoose is the most numerous with 20 %.

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[6] In this corpus there were only two seals with the name of Aya without Šamaš (PORADA 1948: No. 349; MOORTGAT 1940: No. 367).

[7] KUPPER concludes that these are all variations of the same god's name (1961: 69-70).

The seals with the name Amurrum mentioned show the principal figure holding a mace 8 times which is more often than the god holds a crook on these seals, 2 times. Kupper says that Amurrum is not to be identified with the god with the mace but rather only with the god who holds a crook (KUPPER 1961: 13). Our corpus indicates that this may not be the case since here the god holds the crook 9 % of the time and the mace 35 % of the time. However with such low numbers it is impossible to form a conclusion. The god with the mace is not always Amurrum as can be seen below. The whole question should be examined again after all the known inscribed seals have been analyzed. The god on the seals with the name Amurrum can also hold a cup (three cases, 13 %). It is interesting to note that the principal object of worship on these seals is often found standing while the gods on the seals naming other gods are either ascending with one foot on a mountain or stool or they are in a seated position. The figure with the mace also does not wear the traditional dress of the gods nor does he have a horned headdress. This has led some to think that the figure is actually the king who has taken on some aspects of divinity — not unknown from other sources for the Old Babylonian period (see VAN BUREN 1952). However our information here would tend to identify this figure instead with Amurrum. For instance, even though the god on the seals naming Amurrum is not often found holding a crook, there is frequently a crook placed in the field (8 times, 35 %). Also in the field is a star disc in a crescent, 17 %; Kupper states that in this period Amurrum is many times associated with Sin (KUPPER 1961: 88).

The third most common name in our corpus is Adad. He is not significantly associated on these seals with any object he is holding or standing on. But on the seals with his name in the inscription the lightening fork on the bull ocurrs in 28 % of the cases.

The last deity whose name appears a number of times is Ninšubur. While an inscription naming Ninšubur is found on seals which traditionally show the god with the mace, the seals naming Ninšubur often have a vessel in the field (37 %) and very rarely have a ball staff shown with it.

In the chart on figure 2 it is important to note the negative evidence for associating a motif with a god, e.g. on no other seals except the seals mentioning Šamaš do the vessel and ball staff appear [a]. At the same time the seals with the name Amurrum do not have a vessel in the field.

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[a] Professor Jacobsen has suggested to me that the ballstaff may have been an abbreviated way the seal cutter had to depict the staff and ring shown in the hand of Šamaš on the stela of Hammurapi. See VAN BUREN 1949.

4. Conclusion

While this project is a long term one and is now only in its initial stages, it has wide implications for the study of all Mesopotamian iconography (not just limited to cylinder seals) as well as the combination of stylistic and iconographic evidence with other historical data. The example given here is a small sample of the possible future uses of this material. It is envisaged that the project will build up an open ended data bank whose input will be flexible enough so that answers to questions not now anticipated can be given.

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POSTSCRIPT

The identification of the god Amurrum on cylinder seals as suggested in this article is confirmed by an Old Babylonian seal from the Hermitage (No. 6447), which includes an unusually explicit cuneiform legend. The seal (of which only a description has been published) shows a short skirted, standing figure, holding a mace in his hand and with a crook in the field. The text of the legend reads as follows (as published in transliteration, except that GÁL is a correction for GAL, which is presumed to be a printing mistake).

1. ᵈil amurrim   the god of the Amorites (i.e. Amurrum)
2. GIŠALAN ŠEN ŠU.GÁL   the statue holding the mace in the hands
3. ŠUL.A.LUM DU₈.DU₈   (he/it is the one) who releases sins.

The interesting implications raised by this seal—especially whether the figures depicted on the seals are in fact representations of statues, and whether some of these seal designs may be interpreted as representations of actual ceremonies—will be discussed elsewhere. The main point of concern to us here is the explicit, epigraphic identification of the god and his attributes. The article (L. A. Lavlinskaya, "On the Iconography of the God Amurru in Old Babylonian Glyptic», *Proceedings of the All-Union Session of the Ancient East, 6-7 April, 1971 (Technical Report)*, Academy of Sciences, Georgian SSR, Department of Social Science, Tbilisi 1971) came to my attention only after my manuscript had been submitted for publication. I owe this reference to P. Michalowski, who was kind enough to give me his translation of a copy of the article which he had received from A. Spalinger. To both I wish to express my gratitude.

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Fig. B – Tabulation of contact and non-contact features in inscribed seals naming deities.

CONTACT FEATURES

	Holding saw	Holding cup	Holding mace	Holding crook	Holding lightning fork	Ascending	Standing on bull
Šamaš	11	11	3	9			
Amurrum	2	3	8	2			
Adad	2	1	2	4	2	1	3
Ninšubur	1	2	6				

NON-CONTACT FEATURES

	Crescent	Star in crescent	Ball staff	Vessel	Ball staff & vessel	Mongoose	Crook	Lightning fork
Šamaš	21	4	15	16	12	9	4	1
Amurrum	4	4	1	3	2		8	
Adad	4	1	1	3	3		3	6
Ninšubur	2	1	3	6	1	1	3	

Total number of seals with a given god's name:

God	Number
Šamaš	46
Amurrum	23
Adad	21
Ninšubur	16

[1] Numbers within histograms refer to total number of occurrences.

[2] Histograms refer to percentages of attributes per number of seals with a given god's name.

[3] Percentages do not add up to 100 % since more than one attribute may occur on the same seal.

Fig. A – Binary system for categorization of attributes in Old Babylonian Seals.

- **Seal or sealing**
  - **External**
    - **Context-bound**
      - Antiquity: Provenience, Date, etc.
      - Present: Location, Publication, etc.
    - **Context-free**
      - Measurement: Size, Material, Shape, etc.
      - Workmanship: Technique of carving, Mode of attachment, etc.
  - **Internal**
    - **Epigraphic**
      - Names: Personal name, Divine name, Geographical name, etc.
      - Qualifications: Profession, Hierarchical relationship, etc.
    - **Figurative**
      - **Whole**
        - Complex of compositions
          - Number of individual compositions: 1, 2, 3, etc.
          - Type of overall structure: Linear, Triangular, Scattered, etc.
        - Individual composition
          - Compositional patterns: Linear, Triangular, Scattered, etc.
          - Component elements: Background, Groundline, etc.
      - **Parts**
        - Principal (figure)
          - Figure
            - Form: Posture, Dress, etc.
            - Meaning
              - Role: Supplication, Intervession, Reception, etc.
              - Identification: Human, Divine, Animal, Composite, etc.
          - Description
            - Features: Mace, Cup, Chair, etc.
            - Location: Hold in hand, Supporting seated figure, etc.
        - Adjunct (non-contact feature)
          - Description: Star, Fish, Tree, etc.
          - Location: Between figure 1 and 2, Upper, Middle, Lower, etc.