DIYALA PROJECT

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Despite many obstacles and challenges during the year 2002/2003, we moved substantially closer to our goal of electronically publishing all the 15,000 objects from Tell Agrab, Tell Asmar, Ishchali, and Khafaje, four sites excavated by the Oriental Institute in the Diyala Region in Iraq between 1930 and 1936.

This has been a difficult year for our project, first and foremost due to the tragic events that happened in Iraq. Months before the war started, scholars publicly expressed concern about the threats that military combat poses, not only to archaeological sites but also to museums (for the impact of the war in Iraq on archaeological sites and the looting of the Iraq Museum, see McGuire Gibson's Nippur and Iraq at Time of War and my Iraq Museum Project in this *Annual Report*). Our worst fears seemed to have come true in the days following April 9, when newspaper reports and initial television clips suggested a total loss of the Iraq Museum's collection. Such a catastrophe, too staggering for an archaeologist to grasp, would also have meant a loss of 50% of the Diyala material (ca. 8,000 objects), including most the finest pieces from these excavations. Thanks to the foresight of the museum staff, who removed many objects from the exhibition or stored them off-site before the war, the initial estimates fortunately turned out to be too high. Yet, there is no reason to celebrate. Some 12,000 objects are currently (July 2003) confirmed to have disappeared from the museum's storerooms, among them 4,875 cylinder seals. This is a particularly tragic loss for Mesopotamian scholarship. Often made of precious stone (e.g., lapis lazuli, hematite, jasper, and carnelian) and decorated with elaborate designs, cylinder seals have been major collectors' items ever since interest in the ancient Near East awoke. As a result, most of the seals known today (no statistics have ever been published but 90% or more seems like a reasonably cautious guess) came from the antiquities market. This leaves many questions open concerning their provenience, chronological placement, as well as their authenticity. The cylinder seals at the Iraq Museum represented the largest collection of properly excavated Mesopotamian seals, which explains why their loss or decimation is so devastating to us.

To those of us who are working on the Diyala material there is a personal component to this tragedy. Excavations on other sites in Iraq such as Ur, Uruk, Nippur, Girsu, Assur, and Nuzi have recovered truly spectacular seals. However, in terms of absolute numbers, periods, and styles represented, the corpus of 1,235 seals recovered in the Diyala excavations remains unmatched. In fact, the Diyala seals still are the backbone for Mesopotamia's seal chronology between 3300 and 1800 B.C. The significance of this corpus was not lost on Henri Frankfort, the field director of the Diyala expeditions, who in 1955 published the monograph *Stratified Cylinder Seals from the Diyala Region* in the Oriental Institute Publication series (OIP 72). Even now, reading the words "stratified" and "cylinder seals" in sequence may strike some scholars as odd — for too long seals have been treated and published as art objects in museums, far removed from the dirt that once covered and dated them. We can barely imagine the impact that Frankfort's decision to publish the Diyala seals *not* sorted by iconographic themes and stylistic dates *but by archaeological site, level, and locus* must have had on scholarship. Its long-term effect may not even have been clear to Frankfort, but we are certainly more than grateful for his visionary idea. Since 1955, the correlation between stylistic dates (such as Jemdet Nasr, Mesilim, or Fara style) and absolute year dates has been subject to substantial realignments, which makes cross comparisons between seals from different sites, let alone with objects from other artifact categories, difficult if not impossible. The Diyala seals remain one of the few *cor-*

pora for which chronology can be re-evaluated based on its archaeological sequence and where chronological, as well as functional, correlations with other artifact categories such as reliefs, sculpture, and pottery from the same context can be studied. It is therefore more than distressing to learn that as many as 600 of these seals — about half of this corpus — may have been lost in the looting of the Iraq Museum. Needless to say, we expect that other artifact categories have been affected by the museum looting as well — as yet we still have little information as to which objects have been looted or damaged.

Such is the impact that the tragic events in Iraq have left on us. Our ongoing database work, despite the upheavals of the last year and many sidetracks, still proceeded with success. This is largely thanks to George Sundell, who joined our project in the fall of 2000 and who has been working on the transfer of the Diyala database to a new, web-compatible layout with Oracle 9-i as its back-end application. As described in last year's report, George and I have been working on a new layout that will allow systematic searches while preserving the data integrity of the original records with all its idiosyncrasies. By creating a virtual archive on the web, including not only photographs and descriptions of objects but also all the archival material such as field plans, diaries, and locus cards, users will be able to evaluate and question our own interpretations. Access to all the archival Diyala material through the web will allow primary research to be conducted on this material without the necessity of travel to Chicago.

Laying out such a model in theory was one step. Implementing it is quite another matter, as we learned in the course of the last year. Naturally, we anticipated that numerous problems would show up during this process. While all of them have so far been solved, they forced us to do a lot of rethinking in the way we structure and link our data. A database layout is based on logically and systematically defined relationships between distinct elements of information, and its success is dependent on consistency in data entry. Last fall, we ran into problems when we started to work on archaeological provenience data, information concerning the find context of the objects. Figure 1 illustrates some of the issues with which we had to deal. It shows an isometric view and two sections of a hypothetical excavation area (Area A), in which two consecutive levels (Level I and II) are exposed. Both Level I and II contain distinct, different buildings, whose rooms are labeled with locus numbers. In most recording systems a locus number is kept unique and not reused at a lower level. If index tables for the correlation between locus numbers-to-level and level-to-locus numbers are available, a unique locus number also identifies the level at which the room with this number was found. So much for the theory. Three typical situations, mapped out in figure 1 in isometric and section view and marked contexts *a–c,* show how the reality in the Diyala field recording could differ from the theory:

a — a room (Locus 1) in Level I overlays two rooms (Locus 2 and 3) at Level II.

b — a room (Locus 4) in Level I largely overlaps a room in Level II. While the change of level was observed and recorded, the locus number was not changed for some reason. Although at different levels, both rooms are labeled Locus 4.

c — The dashed line between Level I and II indicates that the change between these levels was not noticed and therefore not recorded during the excavation. The rooms at both levels are labeled Locus 5.

Such differences in archaeological field observations impact the level of detail to which the archaeological provenience of an object can be narrowed. In context *a*, the locus numbers are unique within the area. An object recorded from Locus 1 *has* to be from Level I, while an object from Locus 3 *has* to be from Level II, even if the level is not spelled out in the object register.

The uniqueness of locus numbers is missing in contexts *b* and *c*. In *b,* the change of levels was noticed and recorded, so objects can be assigned to their proper level and building despite the ambiguity of the locus number. In *c*, however, no level was recorded at all, making it impossible to distinguish an artifact assemblage by level and building in this case. When trying to create a structural layout for an archaeological database (fig. 2), the lack of uniqueness in some values and the occasional absence of other values have their consequences. Traditional models assume a hierarchy of site subdivisions ordered by area, level and locus (fig. 2.1), areas are divided into levels and levels into loci. Such a layout could easily be adapted into a relational database, if levels names are kept unique within areas and locus numbers are unique within both areas and levels. However, as figure 2.2 shows, only context *a* with its unique locus numbers per level meets this demand. In context *b* the locus number is not unique to a level, creating an ambiguity in the data structure. Since no level was recorded for context *c* it would be impossible to link area and locus in the layout given in figure 2.

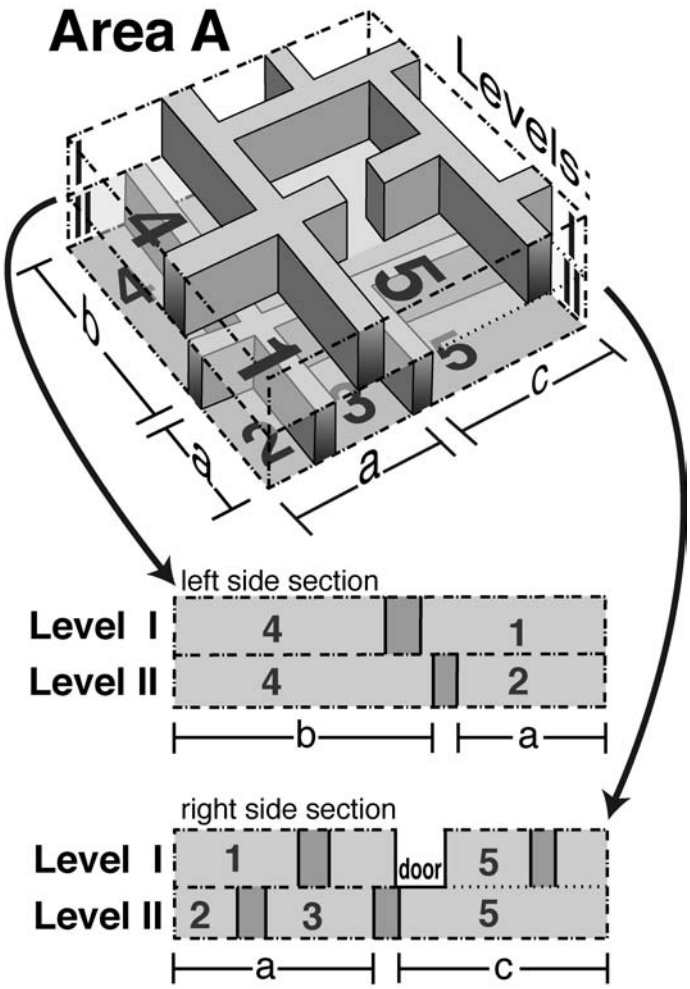

Figure 1. ARCHAEOLOGICAL REALITIES encountered during an excavation often result in notable inconsistencies in the recording of features. This isometric view of a hypothetical excavation area (A) with two superimposed archaeological levels (I and II) shows three contexts with different recording scenarios, also shown in two sections. In a the difference in level was noted and different locus numbers were used for the rooms in the Level I and II; in b the levels were kept separate but the locus number was not changed when penetrating into Level II; in c the change from Level A to B remained unobserved, making it impossible to separate the archaeological material from this context by levels. Such different qualities in digging and recording complicate the systematic processing of archaeological data in a computer database

Quite clearly, the Diyala archaeological sequence required a more flexible layout. While the sequence had to be systematic and searchable it also had to reflect the idiosyncrasies of individual excavators and the differences in the quality of the original records. It took George and me several attempts and a clear departure from our own traditional concept of how to structure archaeological data to come up with a satisfying solution. The model we chose to employ is shown in figure 3. Instead of putting area, levels, and loci into separate, hierarchically linked tables we now put them all into one table (called "Object Table") that contains their names and descriptive elements. A separate table ("Relationship Table") expresses links between objects and the nature of their relationship. Area A and Level I, for example, can be linked

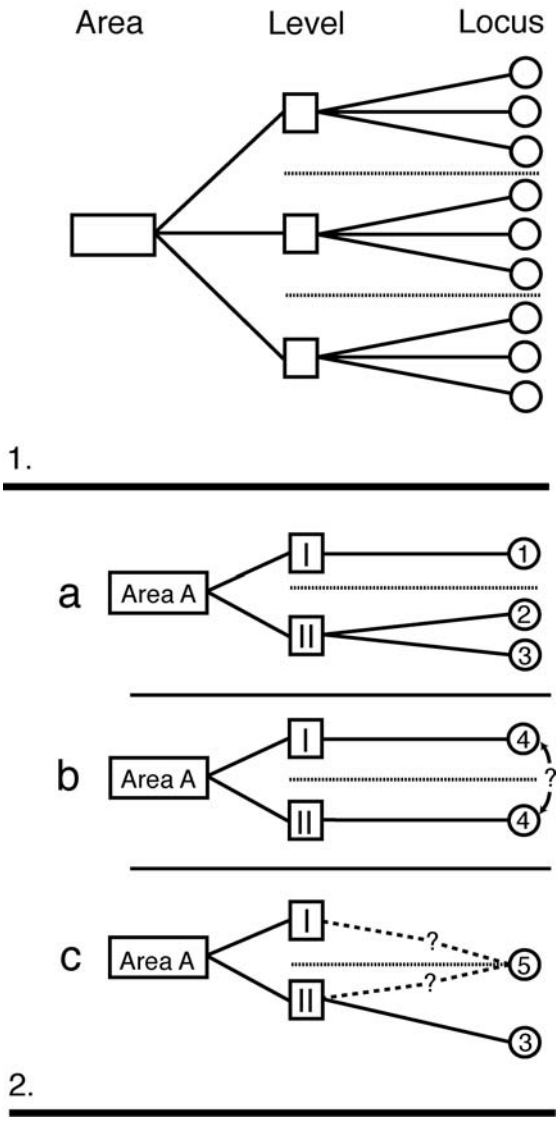

Figure 2.1–2. TRADITIONAL ARCHAEOLOGICAL DATA MODELS (fig. 2.1) rely on a hierarchical relationship between area, level, and locus. Figure 2.2, which displays data models for contexts a–c recorded in figure 1, shows, however, that only context a can be processed and linked properly in this layout; the evidence from b creates an ambiguity in the data structure since the locus number is not unique to a level; in c the absence of a recorded level precludes any link between area and locus

and their relationship expressed as "Area A 'contains' Level I." Area A also "contains" Level II, while the relationship between Levels I and II is that "Level I 'is above' Level II." The attraction of this layout is its flexibility. The relationship between Area A and Locus 5 from context *c* can now be defined by the expression "Area A 'contains' Locus 5" even if no level has been recorded. All known relationships between units of site subdivisions can be expressed systematically without losing idiosyncrasies in data recording, but none of them is mandatory. The possibilities in expressing relationships are almost endless — relationships between loci could be expressed (e.g., "Locus 2 'abuts' Locus 3"); features found within a locus (e.g., pits, hearths, benches) could be added as a further subdivision of a locus into the Object Table; features that extend into several loci (e.g., drains) can be linked to any locus that they pass through without duplicating descriptions. Multiple relationships can also be expressed — a locus, for example, can "contain" a drain but also be "cut" by it. Control mechanisms can be turned on to prevent contradiction if requested (e.g., a level that is "above" another level cannot also be "below" it) but can also be disabled to faithfully reflect contradictions as they are found in the field notes.

This example shows one of the typical daily challenges that one encounters when trying to enter "old" data into a computer database systematically. Physically, we may have shifted from paper to electronic data a while ago, yet we are still learning how to overcome the restrictions that the two-dimensional data layout on paper once imposed. To some this work may seem tedious, but most archaeological data from the Near East is "old data" from excavations that were undertaken long before the common use of computers in archaeology. The lessons learned with the Diyala material will be more than useful for other web-based publication projects.

At this point, the data transferal of the archaeological material is nearing its end. Parts of the physical object descriptions have already been transferred, others still need to be dealt with, though most of it should be accomplished within the next year. A major challenge remains in the addition of digital photographs and scans. The recent events in Iraq have changed our outlook

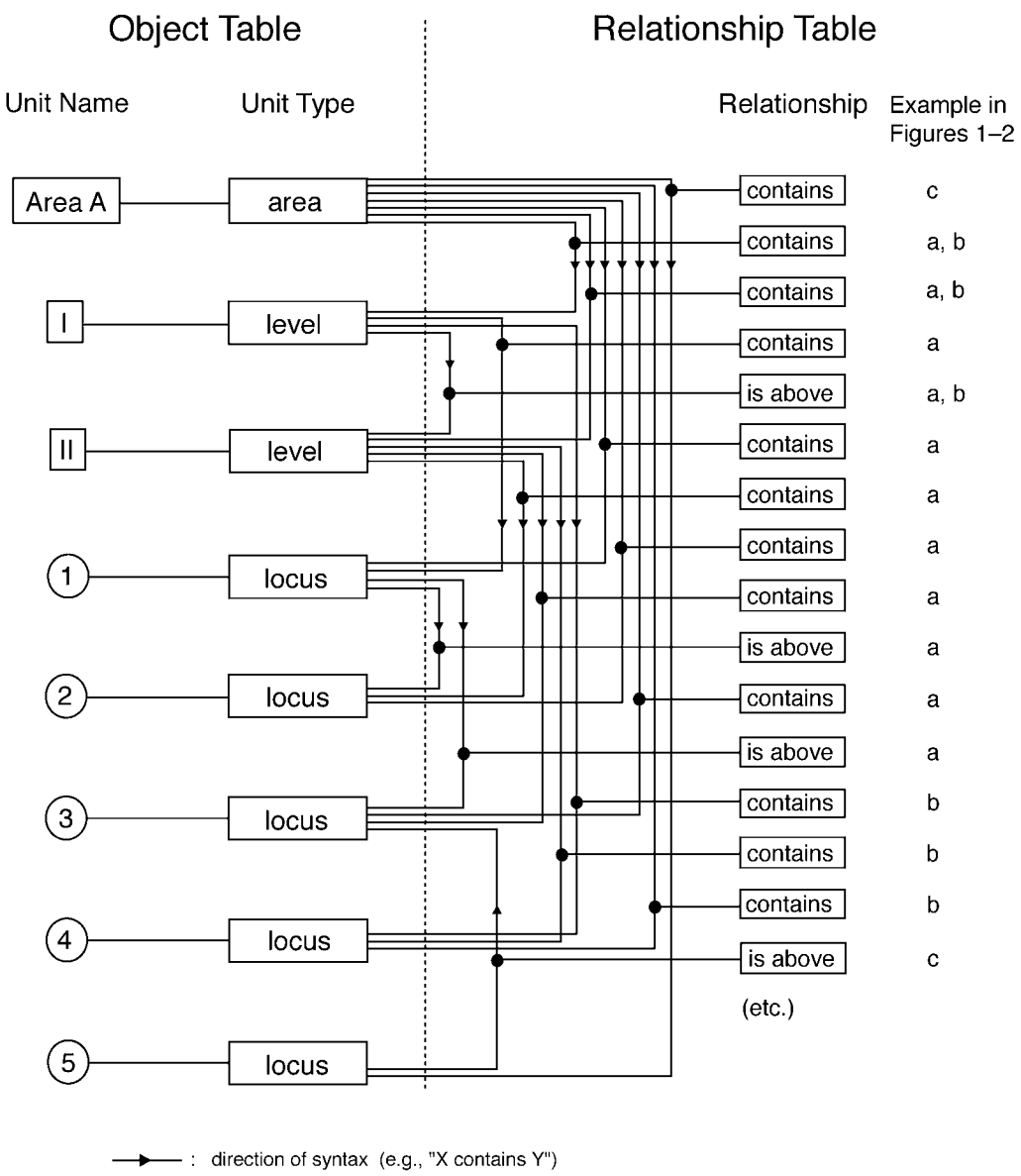

Figure 3. AN OBJECT-ORIENTED DATABASE allows the entry of archaeological data without a strict hierarchical layout. The left side shows site subdivisions (here area, levels, and locus numbers from contexts a to c in fig. 1) that have been entered into an object table; relationships between these entries are expressed by links via a relationship table on the right side, that contains expressions of relationships. Since no link is mandatory and no relationship is dependent on the presence of another one, the idiosyncrasies of archaeological field records can be reflected faithfully without losing the ability to do systematic future data searches

concerning the photographs of the Diyala objects. Whether destined for Chicago or the Iraq Museum, almost all objects were photographed during the 1930s excavations using a large-format camera. Between 1996 and 1998, these images were scanned by a Diyala Project volunteer. Since we did not have the technological means to scan negatives of this size, they were scanned from photographic prints. A scanner capable of handling large-format negatives became available in 1998 in the University of Chicago's Digital Media Lab. We mainly scanned the negatives

of excavation photographs — only negatives of object photographs for which no print could be found were also scanned. We immediately recognized the by-far-superior quality of these scans compared to those from photographic prints. By that time, however, Betsy Kremers and I had already started to take new photographs of Diyala objects at the Oriental Institute, which were scanned by a professional lab and burned onto CDs. The quality of these new images, taken with 35 mm single lens reflex cameras and macro lenses, clearly surpassed those from the 1930s, which often contained more than a dozen objects in one photograph. We decided to re-photograph wherever possible and, as a first step, to concentrate on the documentation of the Oriental Institute Diyala material. We had hoped that sooner or later the political situation in Iraq would improve, the embargo following the 1991 Gulf War would be lifted, and we would be able to re-photograph the Diyala material in Baghdad as well. The looting of the Iraq Museum obviously forced us to rethink this plan. With so much uncertainty left as to which objects have been stolen, the old field photographs are, at least for the time being, our main and sometimes only image source for Diyala objects in the Iraq Museum. For the moment we will "content" ourselves with the positives of those photographs that we have already scanned. However, we will soon start to scan the original negatives in order to have these images at the best possible quality. Due to insufficient fixation while in the field, some of these negatives have deteriorated over time. Digital imagery helps reduce these effects and remove scratches or fingerprints. Figure 4, a photograph of three stone vessels, gives an example of a typical Diyala negative; figure 5 shows the positive of a cleaned-up high-resolution scan of the negative featuring two of these vessels. Even

Figure 4. A DIYALA FIELD NEGATIVE showing three stone vessels. The field numbers of the objects were added in handwriting, to which the museum numbers were added later. The negative has suffered numerous scratches and shows cracks and signs of brittleness along its edges

if photographs taken from other angles would be necessary for exhaustive publication, these objects can be considered as adequately documented.

Thanks to Betsy's tireless work, the photographic documentation of Diyala objects at the Oriental Institute itself has been progressing well and so far resulted in about 6,500 new photographs. Photographs were taken with a 35 mm SLR on black and white film; these images were then scanned by a professional lab and returned to us on CDs. This system had worked well for us and resulted in excellent pictures, but a significant drop in prices for digital SLRs recently encouraged us to upgrade to a Nikon digital SLR with a macro lens. With an image size of 6.1 Megapixel, the photographs taken with it are of a high resolution and of publication quality. Working with this camera will speed up photography dramatically and allow for a much faster turnover, since images will now be available for immediate use.

Figure 5. A DIGITAL POSITIVE of two of the stone vessels shown in figure 4. Digital modifications can help significantly reduce the effect of aging and handling on the image quality found in old negatives

We are currently trying to raise sufficient funds to upgrade our computer equipment, hire student assistants, and pay programmers to work on the browser interface for the database. While plenty of work remains to be done, we hope to launch a first version of the Diyala website within 2003/2004. Launching this site, however, will just be the beginning of a process that we anticipate to take years. Once it is up and running, scholars worldwide will be able to study this material and undertake a more detailed analysis of object categories, which will give us a chance to update our site and add information as it becomes available. Many field notes, catalogues, object cards, and plans still need to be scanned and added to the "Virtual Diyala Archive" in the next few years. As can be seen from this report, launching an electronic publication of this size poses substantial logistical challenges. Unlike a book publication it will also require maintenance, frequent software and data updates, and, therefore, a long-term commitment by the Oriental Institute to host and maintain it. In this respect, the Diyala Project will be a first — both a milestone and test case. Hopefully, it will soon be followed by other electronic publications of this kind.

The financial contributions of numerous private donors have supported the Diyala Project this year. To all of them go our most heartfelt thanks for their generosity.