The image of Egypt as a gift of the Nile it's present in popular belief from Herodotus, but the Nile was only one of the aspects of the Egyptian civilization, important, but the Nile was a minor deity. However, the hydraulic thesis of Wittfogel (1957), defended, adapted, or rejected, the fact that other ancient civilizations were originated near rivers and the vision of modern Egypt, favoured the idea that Egyptian civilization was based in the exploitation of the Nile and it floods, a hydraulic civilization, dependent upon large-scale government managed in water works for irrigation and protection.

During many years, had been apparently accept the premise that the climate and environmental circumstances in Egypt has always been the same: the ancient Egyptians have to exploit the Nile floods which, when they were to low or high, provoked internal problems. Certainly continued drops in the annual Nile flood level did provoke important socio-economic changes, and thereby, political changes, which would explain, but not totally, some of the crises of Egyptian civilization (Bell:1975); "...there is growing evidence that the economic history of ancient Egypt was primarily one of continuous ecological readjustment to a variable water supply, combined with repeated efforts to intensify or expand land use in order to increase productivity. It is in this sense that hydraulic civilization in Egypt remains inconceivable without its ecological determinants" (Butzer 1978:17).

We try to study how, when and why water works to control, or exploit, the Nile floods were begun and the repercussions that this would have had in the social and political structures of the chiefdoms that existed before the appearance of the State in Egypt. Two aspects must be examined: the climatic and environmental circumstances of predynastic Egypt and the influence of these works on kingship ideology and administration.

### Climate and environment

The repercussions of low or high floods in the economy and in society are always mentioned in the attempt to explain the characteristics of ancient Egypt in a general way. But, these ecological determinants must be defined and used with caution: irregular floods over a short or a long time will have important consequences only if a series of other conditions exist: population pressure, extreme dependence on the Nile and its resources or the impossibility of exploiting other lands and, each one of these factors affect differently according to the historical moment.
In regards to ecological determinants, it is generally assumed that Egypt always had the same dry climate and that it was always limited to the alluvial plain. However, before the I dynasty the habitat and the climate underwent distinct modifications, going from a wet climate, with summer rains that allowed the agricultural use of lands neighbouring to wadis, to a drier climate and the progressive dropping of the annual level of the Nile flood. These modifications seem to support the idea of a growing necessity of exploiting the Nile flood and the resources of the flood plain, but this was not the rule, although these changes did affect the political and ideological evolution of the first rulers in the Nile valley, the chiefs.

Until the end of Naqada I, the Nile floods were so high that it was difficult to exploit the flood plain: the Nile borders were only used marginally and the settlements were laid out perpendicular to the river. High floods supported a swampy habitat and fauna that were hostile to man as reveal the pottery decoration of Naqada I (Pérez Largacha 1994). Economy and society did develop in a habitat and climate that are quite distinct from what is traditionally identified with Egypt and water control was not necessary to make economic activity possible.

However circumstances shifted at the end of Naqada I, and during Naqada II the settlement pattern was modified and hierarchized (Griswold 1992), cultural, economic and social development was accelerated. These modifications and advances had nothing to do with the arrival of a dynastic race, as was originally thought, but with environmental and climatic modifications.

The climate became drier, the Nile floods were declining and the temperatures began to fluctuate (Brewer 1991). Wadis and lands neighbouring to the alluvial plain were no longer naturally irrigated by the Nile flood and communities had to move closer to the alluvial plain that was becoming the only available agricultural resource.

These new lands had to be "conquered", a process favored by the important fall in the flood levels that possibly also implied a decrease of swampy areas. Logically the modifications were a slow process that affected differently at settlements, some of them adapted rapidly and others no, something that may help understand the process of formation, and later development, of chiefdoms in Protodynastic Egypt (Pérez Largacha 1993).

This dynamic are reflected on the decorated pottery of Naqada II, where man now dominates the environment (Pérez Largacha 1994), while scenes of conflict are relegated to the edges of the flood plain (Baines 1993).

Therefore, the conditions necessary for the development of artificial irrigation existed in Naqada II, and are possibly reflected on the scenes of decorated pottery, where irrigated lands could be represented as we have found it on Scorpion mace head (Fairservis 1983). Does this imply acceptance of the hydraulic theory? Was the basis of a "hydraulic" state laid in Naqada II? The answer is no.

a) Construction of hydraulic works does not require a society in which the State controls the work of society. Farrington's studies on the hydraulic archaeology (1980) demonstrate that the labor and time required to set up a hydraulic network is minimum. Together with the fact that agricultural tools did not develop in any way, something that, apparently, it's illogical if there had truly been a hydraulic need.

b) Despite the fall in the flood levels, they were still higher than during Pharaonic times and the quantity of land improve was greater. At the end of Old Kingdom, the Nile floods once more decreased (Bell 1975) and, logically, the consequences were more important.

c) It is usually argued that in Naqada II was a demographic growth, as reflected the number of cemeteries, but this increase can also be related with the spread of funerary beliefs. Nevertheless, the population did grow, but this increase should be interpreted and analyzed from the viewpoint of its limited nature (Mortensen 1991). If population pressure had existed at the levels postulated by Carneiro & Bard (1989) the following point would make no sense.

d) Before I dynasty the principal political and population centres were in Upper Egypt (Abydos, Naqada and Hierakonpolis); Middle Egypt was almost uninhabited. What is more,
centers like Hierakonpolis, possibly the most important chieftdom, were in a region where the arable land was very limited, which is why, perhaps, the existence, development and importance of the predynastic centers is more related with aspects other than agricultural or hydraulic needs, as is indicated by their placement on the communication routes (Bard 1987).

e) The development of a hydraulic infrastructure requires State's control of labor to perform the construction of canals, dikes, etc., works planned by the central administration. But before reaching this situation, all other possibilities, such as the exploitation of land in Middle Egypt, would have to have been exhausted. According to Butzer (1978:16) the agricultural use of Middle Egypt "would have required massive labor to bring under control", an opinion shared by Kessler (1981), but the same difficulties were present on the Mesopotamian alluvial plain and it was dominated and exploited (Nissen 1988). So, if the conditions for the creation of an irrigation system had existed in Egypt it would have been developed, but the population pressure and economic needs were insufficient: the small scale irrigation works were enough to maintain the population of predynastic Egypt.

f) The history of predynastic Egypt, as dynastic times, has usually been explained from the viewpoint and information obtained in Upper Egypt. However, the Nile Delta is being revealed as the true motor of Egyptian culture, something that was suspected but could not be documented. Visions of Lower Egypt in this period like Baungartel's (1960), had dominated the investigation, but environmental conditions in Lower Egypt were radically different (Andres & Wunderlich 1992). With Upper Egypt expansion in Naqada IIc-d, new settlements were created, not only by their agricultural or livestock possibilities, also by their geographical location in relation to trade routes with Southern Palestine, a process that it's surprising if there was land necessities.

g) Recently, Hassan (1988) pointed out that the irregularity of the annual floods, together with the risk inherent to the normal ripening of the harvest, may have affected the adoption of hydraulic measures. However we should remember that the level of the floods, even though they were dropping, was higher than in dynastic times, so that the decreases in the levels affected to the predynastic societies in the settlement pattern. Second, it is certain that a continuous series of irregular floods, harvests or natural disasters would condition the attitude of a society, but we must insist that the population levels of predynastic Egypt, would have made the repercussions of these disasters less than those that occurred at the end of the Old or Middle Kingdoms, when population was greater.

Estimations about population in ancient times it's difficult, but Mortensen pointed out, for example, 600 inhabitants to Maadi, 1500 to Naqada and between 2500-11000 to Hierakonpolis (Mortensen 1991:28). Moreover, the communities take measures, as in Hierakonpolis, where large walls, 2.7 m. thick were builded to protect the site (Hoffman & Mills 1993:362). So, the feeding of the population could be insured with limited hydraulic works.

h) If the ecological surroundings had really been bad, there could have been a population rise and a succession of disasters had provoked the creation of a hydraulic state, why is it that after Naqada III, and especially during the I dynasty, many of the previously settled areas are abandoned? centers and regions like Hierakonpolis, Naqada or Abydos, the chieftoms of Upper Egypt, were depopulated and, finally, became small provincial centers (Hoffman et alii 1986). If really the conditions had led to increase water works and control, the decline of Hierakonpolis and other centers in Upper Egypt is, at least, surprising.

Thus, there is nothing to indicate that bases for a hydraulic State were laid during the protodynastic period, but we must analyze the other aspect mentioned at the beginning: the possible influence of environmental modifications in the rise and ideology of chiefs and, lastly, kings.
Ideology and power

A recent paper by Schenkel (1994) emphasized the slow introduction of techniques related with water control and use but, perhaps, the most interesting aspect of his paper is its emphasis on the fact that before the First Intermediate Period there were almost no officials whose titles could be related with the building or maintenance of hydraulic works, and their appearance could be related with the problems at the end of the Old Kingdom. Eyre (1987), has already noted the lack of administrative titles related with hydraulic works during the Old Kingdom. All this seems to confirm that the State paid practically no attention to controlling and dominating water, the small works undertaken on a local level guarantee the feeding of the population. After the First Intermediate Period, the situation changed, but only relatively, since even the "Instructions to the Vizier" barely mention his hydraulic obligations.

However, and despite these data it should be remembered that the first historic documents of Pharaonic Egypt do show a strong relation between royalty and the construction of canals, as on Scorpion’s mace head. How can we explain this primitive relation and its later abandonment? The reasons, in my opinion, should be sought in the evolution of the chiefdoms and their relation with the ecological changes mentioned in the first part of this article.

In Naqada I social and political organization seems to have been quite primitive, and it has been suggested that there were hardly any social stratification or power symbols although Anderson (1992) has recently defended the existence of social stratification as early as the Badarian culture. Without entering this debate, it does seem certain that in Naqada I there were objects that reveals an incipient political and social organization: the red crown found in Naqada (Petrie 1898: pl. LII, n° 75; Wainwright 1923), the scenes on the Gebelein linen (Williams 1987) or the progressive differentiation in the funeral goods and size of the tombs (Atzler 1981). But despite these possible power symbols and incipient social differentiation nothing would have had to do with the control of Nile floods. Leadership in these communities possibly responded to a need of protection against a sporadic threat and to satisfy the religious and funerary beliefs of the population; this leader would have possibly joined the characteristics of a charismatic leadership in Weber's terms.

During Naqada II, the signs of social and political stratification are clear and evident, and they increase until the I dynasty. Aside from the logical process of social, economic and political evolution experienced over time by any community, it is also true that many communities present an evolution the later did not ended in a complex political organization, the state. Therefore, the investigation should search for the causes that did permit the rise of a State, and among them in Egypt, may have been the changes in the ecosystem.

The process of colonizing the alluvial plain would have been well begun by Naqada II. Desiccation of areas like el Fayum, the more arid climate, the lower floods, the dropping temperatures, etc., would all have led to the primitive community leaders to "direct" the adaptation and exploit of the new land, a process that allowed them to increase their own status and charisma before their society.

However, and even accepting the incidence of these changes in the settlement and social, economic and political organization patterns of these communities, it should not be forgotten that between Naqada II and Naqada III, or the dynasty "0", when there was the same material culture in all of Egypt and we can, possibly, say that was an "unification" of the country, there was a long time, even longer one if we take the I dynasty as reference to the beginning of the Egyptian state. This means that, if water and its control had really directly incided in the rise of Egyptian state, the evolution towards the state would have been quicker. But the evolution towards the state and social stratification in Egypt was very slow, while in Mesopotamia it's went relatively quickly. This is why the evolution of leadership and the formation of the State in Egypt should be related with aspects
other than the domination, control and exploitation of the Nile and its floods, although these certainly had some influence.

If the limitation on resources, population pressure and climatic conditions had been important, it would have been necessary to develop a hydraulic infrastructure that would have allowed the sustenance and development of the society and then the process of development into a State would have been quicker, as it was in Mesopotamia, when the environmental instabilities affected the evolution of neolithic societies to states (Hole 1994).

In Egypt, the adaptation to a new environment and the need to exploit the alluvial plain favored the social and political evolution toward a social stratification and laid the bases for leaders differentiation, but once this domination was attained the process seems to have stopped. There was no need to continuously increase the farmland, develop technical improvements or guarantee the food for a constantly growing population. The society and economy did not have to face the arrival of whole peoples, at the same time as there does not seem to have been a need to create a large army or to stand off external threats, factors that would have accelerated the political evolution process. The chiefdoms evolved slowly without external or internal factors that would have obliged them to adopt greater hydraulic or military decisions. Therefore, after conquering the land, the chief had to find something to justify his position and allow him to continue as leader of the community and the process of social and political differentiation.

Therefore the birth of the state in Egypt has little to do with the development of a hydraulic infrastructure. Possibly the reasons for creating a state were many and varied. In the last years different anthropological models have been applied to explain the rise of Egyptian state, but most of these models have been developed from data and research in regions like Mesopotamia or Mesoamerica, and it has been forgotten that each region has its own problems, characteristics and evolution. Egypt, contrary to Mesopotamia, had a totally different hydraulic regime; the floods of the Tigris or Euphrates are unpredictable, more than in Egypt, and the season in which the flood occurred in Mesopotamia implied hydraulic measures. Likewise, demographic rates were greater in Mesopotamia, city-states as Uruk were greater that classic Athens (Nissen 1988:72) and this pression influenced economic policy, water control and the quickly rise of State in Sumer.

This section began with the relation that may have existed between pharaohs like Scorpion and the construction of hydraulic works. Despite the possible "propagandistic" and official celebration of the scenes that are represented, there is another important aspect. According to Herodotus, and this seems to be confirmed by the growth of the Saqqara area from the beginnings of the I dynasty, or even earlier, Menes founded the city of Memphis, and the construction of a new capital requires the transfer of an administration and equally, as in any society, attracts a population that arrives, either to obtain personal benefits, or to undertake the work required in the capital of any State: artisans, potters, officials, etc. This implies an important population increase in a specific place and the need of feeding them. Most of the population were non-productive and rations must be delivery. Couldn't the opening of a canal represented on Scorpion's mace head be related with a necessity of a specific place and not of the entire country? Future excavations in the Memphis area will confirm this possibility, but for the time being, it seems the most likely explanation. Finally, it should not be forgotten that the image of the chief guaranteeing the feeding and security of his community may still underlie in protodynastic objects like Scorpion mace head.

In conclusion, hydraulic works as response to specific, but limited circumstances, were realized in predynastic Egypt, but afterwards the chiefs needed other means of justification, which would explain why the development of the State in Egypt was so slow, and why, unfortunately, so many of its manifestations are so unclear.

Antonio Pérez Largacha
Area Historia Antigua
Facultad Filosofía y Letras
Universidad Alcalá de Henares
ANTONIO PÉREZ LARGACHA

c/o Colegios 2
28801 Alcala de Henares, Espagne

Hieroglyphic Writing, Hierakompolis project, occasional papers in Anthropology 2.


FAISERVIS, W. (1983), Hierakompolis; the Graffiti and the origins of Egyptian

84 ARCHÉO-NIL MAI 1995
CHIEFS AND PROTODYNASTIC EGYPT. A HYDRAULIC RELATION?


PETRIE, W.M.F. (1898), Naqada and Ballas, London.


