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The Old World Background of
The Irrigation System
of San Antonio, Texas

by

THOMAS F. GLICK
ABOUT THE AUTHOR

THOMAS F. GLICK, born in Cleveland, Ohio, in 1939, was educated at Harvard and Columbia Universities. He was a member of the History Department of the University of Texas at Austin from 1967 to 1972, teaching a three-course cycle in the history of Spain. His book, *Irrigation and Society in Medieval Valencia*, was published by Harvard University Press in 1970, and he has contributed articles on various aspects of medieval Spanish history to *Technology and Culture, Viator, Comparative Studies in Society and History*, and *The Texas Quarterly*. Professor Glick was Associate Editor of the *Latin American Research Review* from 1969 to 1972 and was a founding member of the Society for Spanish and Portuguese Historical Studies and first editor of its *Newsletter*. He is presently Associate Professor of History and Geography at Boston University, where he continues research on medieval Spain and teaches a course in the Environmental History of Western Man.

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THE OLD WORLD BACKGROUND
OF THE IRRIGATION SYSTEM
OF SAN ANTONIO, TEXAS

by Thomas F. Glick

In their incisive analysis of the juridical background of the Valmont Plantations suit, A. A. White and Will Wilson suggested that the historiography of Spanish irrigation practices in Texas had been poorly served by a misplaced and excessively legalistic reliance on the civil law tradition, while it had neglected the comparative study of customary irrigation law in the Hispanic world. Irrigation practices, that is, migrated from Spain to America in the minds of men and not in law treatises, as many students of water law appeared to believe. With this in mind, White and Wilson deemed an explication of irrigation practice in Valencia, one of the oldest and most highly developed irrigated areas of Spain, as an instructive comparison particularly in the evaluation of the legal basis of the irrigation practice of San Antonio, and Wilson thought it "highly probable" that the irrigation system of San Antonio had been "modeled upon an existing Spanish system," although he was unable to identify the progenitor in question. It is my purpose here to follow more explicitly and in greater detail along the lines suggested by White and Wilson in order, first, to show the provenance of the customary irrigation arrangements practiced in Spanish San Antonio and, second, to place this system in the historical and geographical context of irrigation practice in the Hispanic world at large.

The Spaniards brought with them to the American southwest a constellation of arid-land techniques, including both the technology and institutional framework for irrigation and the distribution
of water. These customs and techniques represented, in turn, a prior diffusion of Near Eastern culture introduced into Spain by the Muslims in the early Middle Ages. Although custom differed from place to place and that of eastern Spain was distinct from that of southern and western Spain, the Islamic substratum lent to the entire peninsula a basic homogeneity of water-distribution institutions. Thus whether irrigation communities were autonomously administered or controlled by a town government, or whether water was considered public or private, attached to the land or alienable (the typical juridical distinctions made by legal scholars) actual practice was based upon a number of suppositions common to all: the irrigators of one canal (or water source) received water in proportion to the amount of land irrigated and subscribed to maintenance costs in proportion to the amount of water used; administration, whether elective or appointive, was entrusted to officials, usually irrigators themselves, who knew the local custom. For this reason, irrigators tended to have substantial power to regulate their own systems, whether formal control was vested in a higher authority or not.

These notions of proportional distribution and individual responsibility to the entire community of irrigators appear, in one form or another, in all but the most primitive Islamic and Iberian systems and were embodied in codifications of civil law, including the Ley de Indias. However, the civil law functioned more as a general norm for the adjudication of disputes than it did in the actual arrangements for water distribution which were guided according to local custom, differing in detail from system to system.

The study of irrigation in the Islamic-Hispanic tradition is one of variations upon certain time-honored themes, and the comparison of the individual systems along the paths of diffusion not only sheds light upon the social structure of the specific communities but upon the underlying pattern as well. To be sure, many of the practices discussed here recur in some form in most administered irrigation systems, whether of Mediterranean provenance or not. But this admission need not detract from the significance of the persistence of discrete styles of water control, identifiable in a con-
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stellation of customary arrangements, consistently found in association in the irrigation communities of this tradition.

The story of irrigation in San Antonio begins properly in the Canary Islands, where in the late fifteenth century, settlers from Spain introduced Islam-derived institutions of water distribution.

Irrigation in the Canary Islands

The seven islands of the Canarian archipelago are located off the Atlantic coast of North Africa, whose landforms and human geography they closely resemble (see centerfold map). Of the seven islands, the two which lie closest to the African shore, Lanzarote and Fuerteventura, have a truly Saharan countenance, with hardly any water sources at all. But the islands of Gran Canaria, Tenerife, La Palma and Gomera are irrigated. The superficial hydrography of all the islands is marked by a complicated system of gullies which branch out from mountain peaks. These gullies not only bear run-off but also carry filtrations of subsoil water, which are formed due to the presence of many layers of impermeable rock.

Given the relative lack of rainfall which, typical of the "Mediterranean climate" of the Canaries, tends to concentrate in the autumn and winter months, the subsoil provides the primary sources for irrigation water. In the past, the water provided by the numerous filtrations in each gully was allowed to amass into a considerable volume until finally it was appropriated for communal or private use upon reaching the lowlands. This water — referred to as the gruesa — represented the aggregate of tens of dozens of small filtrations.

From a climatic standpoint the irrigated islands have been well characterized as "miniature continents," inasmuch as they include a wide range of climatic variation within a comparatively reduced area. In Gran Canaria, for example, the traveller is amazed to depart Las Palmas, climb through semi-tropical garden-plots, ascending through the clouds to reach temperate pine forests, and descend again to Maspalomas at the southern end of the island to find sandy desert, all within scarcely more than 100 kilometers of one
another. Thus it is no surprise that the rainfall pattern admits of wide variation, the most important rains falling at around 1,000 meters in the central parts of the islands, concentrated temporally between October and May with hardly any more all the rest of the year. Thus, on Gran Canaria, the mean annual rainfall ranges from 153 and 154 mm. in the coastal lowlands (Gáldar and Telde); to 526 at Teror, in the midlands; to 705 and 790 in the piney uplands (Valsendero and, in spite of its arid name, Valleseco). The number of raindays reaches 100 per year (28%) at Teror and Valleseco, but southern farmers living in Mogán and Maspalomas can expect but 14 (4%).

The aboriginal inhabitants of Gran Canaria and Tenerife — the Guanches — were a largely pastoral people; they lived in the interior and practiced some agriculture (cereal crops) on the basis of a primitive system of canals, drawing water from the gullies. When the Spaniards arrived in the late fifteenth century, they extended and greatly intensified the native systems and inaugurated many new ones. The Spaniards were irrigating in Gran Canaria (Gáldar) as early as 1487, and royal provisions relating to organized irrigation communities or heredamientos appear in abundance in the first decade of the sixteenth century: Telde (1501), Arucas (1505) and Tenoya (1506) on Gran Canaria; Güímar (1500) and La Orotava (1501) on Tenerife; and Argual y Tazacorte (1502) on La Palma.

The configuration of irrigation agriculture which lasted intact until new exploitations of subsoil water were undertaken in mid-nineteenth century was set by the first generation of conquerors. Settlement was largely a function of the availability of water and lowland parcels abutting upon gullies and the few perennial streams were the first distributed to the conquerors of the island. The method of dividing up the land was the Repartimiento, the typical procedure developed in the repopulation of southern and eastern Spain, used in the Canaries and then exported in substantially the same form to the New World. The original divisions of land corresponded to the exigencies of hydrology and economy. The objectives in forming the repartimientos included (1) the need
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to respect the natural confluence of small sources in order to compose large volumes of water which would not vary too much in the dry season; (2) the assurance of equity in the access to water of all right-holders, effected by the division of water into aliquot portions; (3) a corollary to (1) and (2), considering the entire debit (called gruesa or masa) as an indivisible whole, belonging to all the users in common until the water reached the points of division, after which each user was considered the owner of a certain portion of the water; (4) the need for cooperation among all the participants of each gully to control distribution arrangements. 8

The early grants to settlers were of two types, apparently indistinguishable in practice: either land was granted, to which was adscripted enough water to irrigate it; or water was granted, along with however much land it might irrigate. In all cases, it appears that originally water was not alienable from the land it irrigated. 9 Somewhat later, a process was set in motion which led not only to making these vague rights explicit, but also to the progressive privatization of water rights, a phenomenon which had little practical effect until the nineteenth century, however.

By the end of the first decade of the sixteenth century, extensive irrigation networks serving a booming sugar industry were in full flower. The spatial arrangements of each system were geared to the sugar mills (ingenios) whose importance was such that a de facto servitude was established in their favor. As a result, from 1517 (and in all probability considerably earlier) lands higher than 300 meters were deemed legally unirrigable (secano) whether located on a gully or not, a practice which assured the preferential passage of all water to the cane fields and mills below. 10

In the first quarter of the sixteenth century, after the initial phase of settlement was completed, there took place a process of institutionalization of irrigation arrangements, whereby the government sought to assure stability and justice in distribution arrangements and, at the same time, the irrigators, reacting to a situation of chronic scarcity of water, attempted to make explicit the concrete, but vague, rights to water assured to them in their original grants. Below, the two developments will be discussed as one historical
process, inasmuch as the need for increased control must be seen as the result of making vague grants of water explicit in terms of discrete measures and time units. Once an irrigator was assigned a specific allotment of time or measurement-units, clearly there must have arisen the need for some check to ensure that he took no more than his allotted share.

It will be seen from the Canarian case, that adscription or non-adscription of water to the land are not dichotomous variables corresponding to two different ways of looking at water use. Rather, they are related sequentially. The basic principle, as seen for example in the huerta of Valencia, is that water is public and that the irrigator has only usufructory rights to its use. In Valencia, irrigators of the huerta have the right to take water in proportion to the amount of irrigable land they hold. They take at will, but when water is scarce, they are subject to a turn. In this case too, the irrigator draws as much water as he needs for his fields; the only control is that he may not irrigate again until every other member of the community has watered his fields. In Alicante and the oasis-like huertas of the southeast, however, water originally adscripted to the land became alienable, a process similar to that which transpired later in the Canaries. There are two basic reasons for this phenomenon: first, the relative scarcity of water in Alicante, Elche, Novelda, etc., in comparison with Valencia, favored an arrangement whereby a minimum of water was wasted, even though it might promote inequities in access to water. Where water is scarcer, the interests of efficient use are best served if the total volume available is divided not into aliquot parts, but rather into measurable units which can, through the medium of sale or rental, be provided to the users in greatest need through the functioning of a market in water. Second, this ecological tendency was abetted by an increasing tendency in Spanish administrative law to favor privatization of water. In the later Middle Ages water, which had almost universally been considered public until that epoch, became subject to increasing patrimonialization. It was appropriated, first, by kings and regional lords, as part of their royal or seigneurial patrimony; by towns who reserved certain waters
(aguas de propios) for public use of townsmen, but which often became in effect simply another source of municipal income as rights to the use of town-owned water were sold or rented; and finally, by individuals.¹¹

The conquest of the Canaries and, later, of the Indies facilitated the spread of late medieval doctrines of water use, which preserved the notion of public use of water as an ideal, but which in practice favored the patrimonialization of water sources, particularly as part of royal domain. Gran Canaria and Tenerife were considered royal domain and grants of water made by the king came increasingly to be considered as essentially private, and therefore to some degree alienable. The result was an inevitable confusion between public and private law, characteristic of the water law of the later Middle Ages, which has persisted in Canarian irrigation till the present and which characterizes the legal structure of the individual heredamientos, as embodied in their ordinances.¹²

The process by which the vague grants of land with adscripted water or water with adscripted land were translated, through the dictates of necessity, into palpable rights to certain specified amounts of water is known in the Canaries as adulamiento, a process which began soon after the first round of grants was effected and which was largely completed by the end of the sixteenth century. The word dula is an arabism found typically in eastern Spain where it means both irrigation turn and by extension a measure of water.¹³ In the Canary Islands it is the most typical and universal irrigation term, differing in meaning from place to place. Adulamiento may be defined as the process whereby the gruesa of each gully was broken down into aliquot parts to which were assigned explicit values in some measurement or time unit, giving the dula or turn a specificity not envisioned or provided for in the original grants.

As indicated above, the first grants to settlers specified (to take an example from Gran Canaria) only so many “suertes of land with water to irrigate it” (suertes de tierra con el agua de su riego)¹⁴ or, in Tenerife, the inverse formula, a grant of water “with all the lands that with its water you are able to irrigate” (con todas las
tierras que con su agua podais regar), or even grants of water made without any mention whatever of land: the grantee was given all the water he could find in a given place and then automatically acquired title to enough land to use it on, provided that neither had been claimed by anyone else previously. Such a vague system could correspond only to the days immediately subsequent to the conquest, when the king and his governors confirmed titles to settlers without proper information as to the nature of the geographical realities of the islands.

So chaotic was this situation that a cry for reform was soon heard, resulting in the Reformation of the Repartimiento of Tenerife in 1506, whereby a royal commission sorted out the conflicting and confusing claims. Among the reforms effected was a provision that hereafter the governor was to specify in regard to certain properties "how many days and hours of water, of night and day, the owners of said districts and places ought to have." A similar process prevailed in Gran Canaria. In 1506 the heredamiento of Tenerife was "reformed" with provision of a turn (dula) of twenty days. The governor's confirmation of a land grant in the heredamiento of Firgas in 1508 reveals that a formal turn had also been instituted there: The Hospital of St. Martin was granted title to two aranzadas of land "to be irrigated with the water of the main canal of said heredamiento, according to its dulas, each dula lasting thirty days (cada dula de 30 en 30 días), and it ought to have for irrigating in each dula two hours of water, irrigating for the said two hours with one azada of water." It is clear from this charter and others like it that the governor of the island imposed the turn and set the rules for each separate heredamiento.

In grants subsequent to this first phase of adulamiento it is common to find explicit units of water assigned to the parcel conveyed. Thus twelve suertes of land in Firgas were sold in 1526 "with sixty hours of water to irrigate it," or the sale of one suerte of land with five hours of water in Moya (also in Gran Canaria), "irrigating by its turns according to the custom of said heredamiento" (regándose por sus dulas según la costumbre del dicho heredamiento). In the case of these and similar grants on Gran Canaria in the 1520's and
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1530's there seems a clear equivalence between one suerte of land and five hours of water. At the same time, there appear the first clear instances of alienation of specific units of water, such as the grant of three hours of water to a party in Arucas as indemnity for harm caused to his sugar plantation owing to the digging of a new canal. Eventually, water rights became totally alienable. There were owners of water who did not have land; these seem at first to have been able to sell or rent their water only for the use of lands within the service area, although in the late nineteenth century even this stricture seems to have been relaxed. The ordinances of Satautejo assert the complete alienability of water "as exclusive property" and add that from this derives the right to cede or sell to "other members of the said community, or outside it," the use of water according to the dula, or to exchange water with other members of the heredamiento. The section on rights concludes with a statement that these arrangements are permitted "for the better fertilization of their estates," stressing the paramount objective of efficient use of available water.

Local conditions promoted a variegated pattern of institutionalization, here examined through a study of the dula, or irrigation turn, of each locality, as the central element of the operating procedure.

The Dula of Gran Canaria

The etymological meaning of dula (and the Arabic word dawula from which it is derived) is rotation or turn. The irrigators of a given heredamiento take water in order, according to the number of hours for which they have rights. The common parlance is "Esta noche a las once me entra la dula" — My turn comes up tonight at eleven. — Or, "Mi dula es cada doce días," My turn comes every twelve days. In most of the 140 pre-modern heredamientos of Gran Canaria the turn was set at a specific number of days, the commonest being fifteen (37 heredamientos), thirty (10), and thirty-one (10). The weight of local practice favored two complete turns per month, even though one system's dula lasted but three days and the longest was seventy-seven. The turns are explicit; the irrigator
knows on what days of the dula and what hour his turn will come up. Nor was much flexibility admitted: only in some heredamientos, for example, were irrigators allowed to swap turns ("cambios").

Curiously, there are several survivals of Valencia-model irrigation systems which never, apparently, completed the process of adulamiento. In the heredamiento of Agaete the dulas are called "indeterminate," because each irrigator takes, in his turn, whatever water he needs, not subject to any measure of time. Thus in Agaete the turn may last anywhere from five to fifteen days, depending on the need of the irrigators at that time. A similar practice prevailed in the heredamiento of El Pinillo (Valleseco) which also had no set dula, each proprietor irrigating with the water unused (sobrante) by the man ahead of him.

The dula has become proverbial in Gran Canaria, supplying local color to such epigrams as: "A este falta una dula como los plátanos" (He is missing a watering, like the bananas), said of a half-baked individual.

Thus, delivery time was controlled through the adoption of a turn. The volume delivered was controlled by a complicated system of proportional measures, rendered into palpable quantities of water in divisors called cantoneras. The standard measure is the azada (a term derived metaphorically from the diameter of an axe-handle). The azada represents the number of (equal) streams into which the water of a given dula was divided. The azada is not only proportional, but has a time function as well, inasmuch as each azada is considered as running for twelve or twenty-four hours. Thus, the Telde system is considered to dispose of six azadas of water, which "irrigate every day in a turn of 27, which is [the length of] its dula." The azada is divided into four cuartas (quarters), which are subdivided, in turn, into sulcos or surcos (furrows). The measures differ in value from place to place, but where the azada runs for 24 hours, the cuarta would have the value of six hours, the surco of three. The number of azadas is indicative of the size of the system, since all are delivered simultaneously, by means of the division of the gruesa in one or more cantoneras. In
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systems where the gruesa is so small that it would be inefficient to divide it, it is divided (as an account unit) into surcos; the irrigator, in this case, takes all the water of the system during his days or hours of dula.

The cantonera is a semielliptical masonry division box, which divides the water into equal portions. Each boca (mouth) of the cantonera represents one azada. A system may have one or more cantoneras but there will be one boca for each azada carried. Occasionally, there will be a boca with a half or double value, but the general principle is that surveillance is easier if all bocas are equal in size and carry the same volume of water. The heredamiento of Arucas y Firgas has a cantonera with twenty-four months, equal in size. The cantonera is the focal point of the Gran Canarian irrigation system, and has served as a natural place of meeting and discussion for members of a heredamiento. Then too, cantoneras also were at the heart of numerous conflicts — the "thieving divisor" (cantonera ladrona), that is, one which because it is not level or is otherwise defective, robs water from one irrigator and gives it to another, has become legendary.

One other idiosyncratic element of the dula of Gran Canaria deserves mention here. This is secuestro, the practice of the heredamiento's reserving one or more days of the turn for sale to the highest bidder in order to pay for the maintenance expenses of the irrigation system. Such a practice is typically Canarian. It would be unthinkable in Valencia, where water is public and the community is a purely administrative and not proprietary body. The Valencian community has no power to appropriate water and sell it for its own benefit.

The origins of the secuestro are obscure. It was not known in the sixteenth century, although it was then the practice to grant the use of excess water (sobrantes) to neighbors. It must have been established, however, by the early eighteenth century because it was introduced by Canarians in Texas.

Considering Gran Canaria in the context of Hispanic irrigation, the secuestro is one of the most idiosyncratic institutions which sets this system apart from antecedent systems in the peninsula.
In medieval irrigation systems, such as those of Valencia, Alicante, Elche, etc., expenses to defray costs of maintenance and repair were met by levying a pro rata tax (cequiatge) upon all members of the community of irrigators, in proportion to the amount of land irrigated. The practice of Gran Canaria is quite different. The normal expenses of the heredamiento are met by placing for sale at auction a specified number of hours or days of water. These differed from system to system depending upon the needs of the community. In Arucas two azadas daily were auctioned for the benefit of the community, plus the thirty-first day in each turn and excess waters called sobras. In Telde twenty-eight cuartas were reserved for secuestro, twelve of the thirteen corresponding to the first day of the dula, and thirty-two half-cuartas distributed throughout the turn. In Tenoya, the system was somewhat simpler. For secuestro were reserved eight half-cuartas of the fifteenth and fortieth days of each turn, and half of the water of the twenty-fourth and forty-eighth days. Any expenses not met by sale of secuestro water were divided among the irrigators in proportion to the volume of water consumed. In the heredamiento of Tafira, the thirty-third and thirty-fourth days of the turn were reserved for the benefit of the community. In terms of water rights the secuestro occupies a place half-way between the public ownership of water of Valencia and the private ownership presently ascribed to owners of discrete azadas or hours of water in the Canarias. Secuestro water is the only water which the heredamiento, the community of irrigators, owns in common; all other water today is considered privately owned.

**The Dula in Tenerife and La Palma**

The regimen in Tenerife and La Palma systems is similar to those of Gran Canaria. Tenerife had but eight heredamientos prior to the nineteenth century, but one of them — La Orotava — was the most highly developed system in the islands, occupying the entire valley above Puerto de la Cruz. The prime connotation of the term dula in Tenerife, however, is distinct from that of Gran Canarian usage. Dula, to be sure, still means irrigation turn, but it has the further
connotation of one day of water. Thus litigation was conducted in 1703 over the restitution of certain “dulas, or days of water.” The 1859 ordinances of La Orotava refer to a regimen of “174 days, dulas, or shares” of water. Moreover, dula in La Orotava refers not only to the turn, but also to “each one of the parcels of land which receives irrigation, by turn, from the same canal.” A further nuance of Tenerifian usage is provided by the example of Icod, where the heredamiento itself is known as The Dula, or Community of Adultos of Icod.30

Irrigation on Tenerife is based not so much on gullies alone as on interconnecting networks of gully filtrations, canals and cisterns. It is this tank irrigation which lends a distinctive stamp to Tenerifian practice. The measurement system is quite distinct from that of Gran Canaria, typical measures referring to the orifice of the delivery conduit (e.g. real, tostón — both coins — or pipa, pipe).

The term secuestro is not known on Tenerife, although cognate practices suggest a similar historical trend toward privatization as on Gran Canaria. From the 1580’s on, it became the practice at La Orotava to sell a certain number of dulas to pay for the expenses of the heredamiento. In 1672, twenty dulas — ten from each of the two main tanks — called “los veinte días de mayo” (the twenty days of May) — were sold at auction for the benefit of the community. In 1673, the ruling junta agreed to auction off eight days of water to pay for repairs to an aqueduct which had been broken by falling pine trees. Clearly the community had the right to alienate water, as evidenced again in 1790 when it granted a perennial tostón of water to the newly founded Botanical Garden — the diversion henceforth known as the Hijuela del Botánico (botanical feeder canal).31

The irrigation scene on the island of La Palma was dominated by the Haciendas of Argual and Tazacorte, an agriculturally rich estate which became the property of the powerful Flemish Grünenberg (Monteverde) family in 1513. The estate was divided in 1557 among five heirs of Jácome de Monteverde, and a formal heredamiento for the control of irrigation waters was established at that time. In the “Grand Partition” of 1613 a dula was established to
The Old World Background of the Palmas and two more for the other canals and heredamientos of the island. They were obliged to walk the whole system once a week to see to repairs and compose differences arising among irrigators with regard to the division of water, executing fines for contravention of regulations. They were to administer the process of repairing damages to those parts of the canal considered in the royal domain (realengo), charging the irrigators for this, pro rata, according to the number of hours of water to which each was entitled. They had to check all canal turn-outs (tornas), making sure that each had a wooden frame (that is, to ensure continuing control on equitable and proportional division of water).35

The alcaldes were directly responsible for efficient functioning of the operating procedure of each system, with authority delegated to a variety of minor officials: the asequieros and repartidores of each system who were also to patrol continuously, giving each irrigator his proper dula. It was the generalized custom on Gran Canaria that no one could take water unless the repartidor was present at the cantonera at the beginning of his dula; the official could be fined if he were absent and the irrigator indemnified by the community for loss of water.36 If a man finished irrigating before the end of his dula, the alcalde was to see that the water be turned back into the main canal and that it not be given or sold to another (an expression of the adscription of water to specific parcels).

Finally, the alcaldes had complete jurisdiction in irrigation matters and were empowered to execute justice summarily, without recourse to usual legal channels ("sin guardar orden de derecho"). The governor of the island was not allowed to intervene except on appeal. Soon after the implementation of the Melgarejo ordinances, however, it became clear that there was not enough control on abuses by the alcaldes, who were, in consequence, placed under the direct jurisdiction of the Real Audiencia. In cases of disputes between irrigators and the alcaldes, immediate recourse could be had to a hearing before a judge of the Audiencia.37

The effect of institutionalization was felt immediately within the heredamientos themselves. In 1532, one year after the ordinances
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distribute the water equitably among the proprietors of the now further subdivided estate: the water was divided into twenty décimos (tenths) or turns of twenty-four hours each ten days, the water flowing in the canal of Argual for ten successive days, and then for another ten in the canal of Tazacorte. Later, these original décimos were divided into hours, minutes and seconds of water, as the turn increased in complexity.³²

Although secuestro is practiced in La Palma presently, it was not a traditional practice. However, the heredamiento traditionally sold at auction surplus winter water ("aumentos discontinuos de invierno") in order to meet maintenance expenses.³³

**Historical Development of Formal Regulation: Gran Canaria**

The heredamientos began to acquire juridical personality early in the sixteenth century. According to a royal decree of January 3, 1508, they were to be guided in the regulation of water distribution by an elected junta, with the agreement of the participants, and under the general supervision of the Real Audiencia of the Canaries. In the two decades which followed, however, it became clear that autonomous community control was not sufficient for adequate control of distribution arrangements, inasmuch as the efficient functioning of the islands' systems was seriously impaired by a growing volume of infractions and disputes as new settlers in higher terrain attempted to divert water from the fields of older right-holders below.³⁴ In consequence, standardized norms were set down and authority to enforce them invested in the cabildo (Municipal council) of the island in the Municipal Ordinances of Gran Canaria, drawn up in 1529 by the jurisprudent Francisco Ruiz de Melgarejo. These ordinances were then officially promulgated by the Real Audiencia on December 4, 1531, and the title dealing with the Alcaldes de Aguas (irrigation officials) became the standard norm for control of water distribution for Gran Canaria until the nineteenth century.

According to the Melgarejo ordinances, the insular cabildo named two alcaldes de aguas every six months for the city of Las
became effective, a rental contract spelled out the duties which would be expected of the parralero: Pedro de la Parra's wife was to take charge of cleaning the canals and paying the repartidor of water. It is unusual to find such duties (which were encompassed in the general ordinances) made explicit in a rental contract or conveyance, inasmuch as it was common knowledge that all holding water rights were bound by the rules of the heredamiento. It may be that these duties were specified because this was a rental contract, rather than a conveyance, and the owner wished to make sure that his obligations to the heredamiento were being fulfilled. However, I think the date is significant. The oldest surviving ordinances of an individual heredamiento are those of Satautejo, dated March 31, 1545. One can assume that this was a period during which the heredamientos, in reaction to the Melgarejo ordinances, were codifying and regularizing their own practice and that proprietors might well have felt the need to spell out rights and duties explicitly whenever possible.

The institution of alcaldes de aguas was a successful one; it lasted until 1833 when the office was abolished. A progressive devolution of power from the cabildo to the autonomous heredamientos had been effected, rendering the alcaldes powerless. The duties of the alcalde in Gran Canaria were taken over by the celadores of each heredamiento. These administrative changes are reflected in the modern ordinances of the heredamientos.

Tenerife

Formal regulation of water distribution was accomplished somewhat earlier in Tenerife. The heredamiento of La Orotava had formal ordinances approved on May 27, 1507, followed by a revised recension on June 28, 1527. The ordinances of 1507 established, first, that an alcalde should be named yearly from among the owners of irrigated land to enforce the ordinances. The alcalde, in turn, appointed a repartidor who was in charge of the day-to-day operating procedure of the system. No one was allowed to take water except in the presence of the repartidor, a regulation which was spelled out more precisely in the ordinances of 1527 which
state that "no one should dare to take the dula of water which comes to him without first asking the repartidor." The Orotava ordinances contain, for the most part, the stock rules common to all Spanish irrigation systems, regarding duties of the officials, obligations of the participants for maintenance and repair, and prohibitions against soiling the water of the canal. A few of the regulations do seem idiosyncratic and worthy of special remark, however.

In the ordinances of 1527, the procedures for punishment of those who refuse to pay their share of maintenance expenses are spelled out in detail and are quite remarkable for their harshness. If the irrigator failed to pay his share of the expenses the alcalde could take his water away or, in the case of a miller owner, the right to use the water could be withheld until he paid. If the delinquent remained contumacious "he might not enjoy any dula of water... but the water shall run through the canal downstream." If participants failed to pay their share of the salary of the officials, they would likewise lose their water, and if the delinquent were a miller, his intake channels were to be broken until he paid his debt. A later ordinance of 1640 is even more explicit: if irrigators refuse to pay, "Let them enjoy neither water nor dula, and let the said water be divided among the other participants until he shall have paid." If a miller failed to keep his canals in repair, his intake channels could be broken and water denied him until he complied. The rigor of these stipulations is cause for note. In the Valencian system it was difficult for a turn to be denied to a legitimate rightholder, owing to the public nature of water. The usual sanction was a fine, or imprisonment.

The judicial process of irrigation officers in La Orotava followed a familiar pattern, dating to Islamic precedents. In punishing common misdemeanors, such as wasting water or taking it out of turn, the delinquent could be seized on the order of the alcalde and relieved of the value of the water he had wasted, without any written instruments or formal judicial procedure.

The alcalde of La Orotava was an important figure and the office was frequently held by magnates (e.g. the Marquéses de Celada in 1675, 1732, and 1787; the Lord of Fuerteventura in 1764; the
Marqués de la Candía in 1819). The alcalde wielded great power in the valley and there was an attempt in the eighteenth century to reduce his judicial powers (which could be easily abused), reducing the office to administrative and police functions only. In the early nineteenth century there was a power struggle between the heredamiento and the municipal government of La Orotava, which based its claims on the grounds that flowing water was public in nature. The proprietors of the heredamiento were attacked as a privileged caste. The municipality prevailed in this battle, the special juridical status of the heredamiento was suppressed, and the power of the alcalde de aguas reduced even more. After 1821 the office was abolished and the president of the heredamiento took over its remaining functions.43

La Palma

It was not until the “Grand Partition” of 1613 that formal ordinances were drawn up for the haciendas of Argual and Tazacorte. These not only established the turn of ten days mentioned above, but also laid down specific norms for the measuring of water each summer, repair of canals, and the appointment of a fiel for each hacienda whose task was to officiate over the division of water.44

Sale of Municipally Owned Water

One of the signs of increasing patrimonialization of water in the latter middle ages was the tendency for municipalities to convert common water into municipally owned public property, or bienes de propios.45 The expropriation of such waters by the city of Las Palmas (and to a lesser extent, of Santa Cruz de La Palma) and their subsequent sale or rental was a characteristic feature of the Canarian irrigation scene.

In 1501, on petition from the cabildo of Gran Canaria, the King granted to the city of Las Palmas the water rising in Tejeda, high in the mountains of the interior. This merced de agua was granted out of the royal domain (note that the King regarded the water as his property, not as public) for the double purpose of promoting irrigation development and at the same time financially underwrit-
Irrigation System of San Antonio, Texas

ing the expenses of the cabildo, which was to derive income from the sale of the water. 46

Las Palmas, it should be noted, was originally watered by the gully or river Guiniguada, one of the few genuinely perennial streams on the island. When the Tejeda water was added to its original filtrations, the Guiniguada provided ample water for the gardens and fountains of the two quarters of the city which it bisected — Triana (named after the famous quarter of Seville) and La Vegueta. The city's irrigation network was described in Arcadian terms in 1678 by José de Sosa:

The river or gully called Guiniguada passes through the middle of [the city] and is divided into two streams or canals which bathe the two parts of the city, that is Triana and La Vegueta. . . . From these two streams, carrying their crystalline liquors through pipes, there derive many fountains which, squandering merry pearls high above the squares and other public places, besides delighting whatever melancholy soul who stops to look, serve the residents as a common gift and accommodating cleaner; these run continually [supplying gardens with water]: it is a rare house which does not enjoy this convenience, owing to the abundance of water which runs through the streets the whole year, water which commonly is left over from the garden plots ringing the city in which are harvested divers vegetables, cabbages, turnips, onions, lettuces . . . and the best figs in the world, and plantings of bananas along their borders which often serve as walls. For which reason this royal city of Las Palmas is one of the most pleasant and happy on earth, for from January to January it has fresh produce, without [anyone] having to venture without its walls to seek it in other parts. 47

Inasmuch as a mountain stood between the waters of Tejeda and their trajectory towards Las Palmas, the cabildo was unable to capitalize on its grant until it first hired an engineer to build a tunnel through the mountain to convey the water. According to the terms of the merced the cabildo was to sell rights to Tejeda water until the 250,000 maravedis (the cost of the tunnel) were made up; any rights remaining were to form part of the propios of the city. The subsequent division of the waters and conveyances of rights thereunto are quite complex. Simply recounted, half of the water was granted by the cabildo to the builder of the tunnel (mina de Tejeda) and at the same time lands enough to use the water were
also granted, a procedure we have noted before. The owners of this water and their successors eventually came to constitute the heredamiento of El Dragonal. The water was apportioned in a thirty-day dula, consisting of sixty "hours" of water during the day and another sixty at night. (This "hour" is a unit of account, with five of them equal to one hour on the clock.) Sixty "hours" belonged to El Dragonal and the other sixty were the property of the cabildo.

Of its sixty hours, the cabildo granted ten along with two suertes of land to Fernando Rodríguez Gallego in return for "good news"; Rodríguez subsequently sold his ten hours to Lorenzo de Vivas, and these hours, which still pay no tribute or rent, are called horas de Vivas. The fifty hours remaining to the city were sold at public auction in 1527 to a certain Licenciado Venegas in return for 50 doubloons per year in perpetual rent. These rights were increasingly subdivided and in 1651 a list of users reveals no less than sixteen parties (each having from one to eleven and a half hours of water) who partook of the city’s fifty hours. In 1652 the rental price was set at 500 maravedis per hour of water, perpetually.48

A similar, but less complicated, arrangement was practiced in the city of Santa Cruz de La Palma, where a certain amount of water was ceded to the city by a royal grant of January 10, 1559. Of this water, the city used a certain portion and sold the excess (sobrantes).49

Canarian Irrigation Systems in Comparative Perspective

We have noted that the royal authority utilized in the conquest and settlement of the islands instruments — such as the repartimiento — which had been tested previously in the conquest of southern Spain from the Muslims. We have also observed the introduction, largely through the medium of royal administration and justice, late medieval legal notions about the relationship of water to the land it irrigates — norms in which patrimonialization played a much larger role than in the earlier period when the irrigation systems of eastern Spain were institutionalized. The extension of Spanish juridical norms to areas newly annexed to the empire was, of course, a hallmark of the Spanish imperial venture. The
major juridical influence in the newly created Canarian society seems to have been effected, however, through the extension of Spanish municipal, rather than royal, law. The islands, by an extension of the medieval practice of including dependent villages and fields within the legal bounds (términos) of the town, were constituted municipalities, each governed by a cabildo. Water, not only for drinking, milling and sanitary uses, but also for agricultural irrigation, was a traditional concern of Spanish town councils. In most of the towns of eastern Spain (especially those which had one main irrigation ditch — called Acequia Mayor, typically — which ran through the middle of the town) irrigation was controlled by the council, which appointed the irrigation officials and financed those maintenance costs not borne by the irrigators. Autonomously governed canals like those of the huerta of Valencia were relatively infrequent. Municipal control was more the rule and tended to become even more frequent in the later middle ages and early modern times, as town councils grew more powerful and the financial needs of irrigation development became heavier. Both in Gran Canaria and Tenerife a form of municipal, or cabildo, control was exercised through the alcaldes de aguas, which did not, however, seriously threaten the autonomy of the various heredamientos. That is, the general administrative and judicial norms laid down for all, did not mean that customary distribution arrangements followed within each heredamiento were subject to ratification or rectification from above. The cabildo’s objective seems only to have been the just and efficient functioning of each heredamiento’s dula, with an eye towards the ongoing wellbeing of the islands’ agricultural economy. Thus, in spite of whatever control was vested in higher authorities such as the cabildo or Audiencia, irrigator control within the heredamientos themselves was substantial. The same is generally true of the municipally controlled systems of eastern Spain; water distribution was handled in basically the same fashion no matter in what entity control was formally vested.

Administratively, there is basic continuity with the irrigation systems of southern and eastern Spain. Institutionally, and legally,
the Canarian systems closely resemble the town-controlled systems of southeastern Spain, where water was not only separated from the land but also where many of the actual elements of the water distribution arrangements closely resemble those introduced into the Canaries. Because of the mixture of municipal and autonomous control, the Canarian systems strike me as institutionally weaker than those of the mainland. Due to a vagueness in the lines of authority and the tendency towards privatization of water rights, the officials seem to have had much less discretionary authority than did those of, for example, medieval Valencia (autonomous) or Castellón (town administered). 51

The legal system of the irrigation system of Moratalla, a Murcian town, is so similar to that of the islands — water held privately, with irrigators grouped into heredamientos — that the heredamientos of that town recently petitioned the government to extend to them the status accorded to the Canarian heredamientos under the terms of the special water law of 1956, applicable only to the islands. 52 Significantly, the Moratalla system was institutionalized in the late fifteenth century, when the town was granted to the military order of Santiago. The resemblance to the Canarian heredamientos is doubtless owing, therefore, to the juridical norms prevailing at the time, rather than to any introduction of site-specific practices from southern Spain into the islands. Patrimonialization of water was more the rule than the exception during the reign of Ferdinand and Isabella and it was common to find this concept embodied in the repartimientos of this period, in Spain and abroad. Revealing too is the fact that places such as Alicante and Lorca which had been settled centuries earlier had double legal systems, where the agua vieja (in Alicante; agua antigua in Lorca) was separated from the land and water proceeding from more recently developed sources was adscripted to the land it irrigated. One might expect the reverse. However, there was also a tendency in areas where water was scarce for rights originally adscripted to land to become progressively divorced. This process was, as we have seen, recapitulated in a speeded-up version in the Canaries during the first several decades of settlement.
Here we see the interaction of juridical norms at two different levels. On the one hand, there was the ancient norm that public water could be appropriated with usufructory rights only. When rigorously applied, however, such a norm may not be conducive to the greatest efficiency in the distribution of water. Thus, the shorter water is, the greater is the tendency to privatize rights in order to make water available to those in the greatest need and so ensure, through the functioning of a market in water, the least possible waste. With time, and the progressive growth of royal and municipal power, and the concomitant trend towards patrimonialization of resources once universally regarded as public, separation of water from land became progressively easier to effect.

Rarely, however, did the divorce of water and land go so far as to permit alienation of water beyond the bounds of the traditionally constituted service area of the irrigation system. The Canarian ordinances were specific and adamant on this point, for the obvious reason that no amount of water could be subtracted from the total gruesa of the system without doing violence to the underlying principle of proportional distribution. It was only in the nineteenth century, when privatization ran rampant, that this sacred precept finally went by the boards.

The origins of the actual institutional configurations of Canarian systems are hard to identify. The use of the term dula can hardly have been coincidental. This arabism is localized in a discrete area of southeastern Spain — in Gandia and Elche, where it means turn; and in Alicante, where it has the connotation of an aliquot portion of water. Insofar as I am aware, the term is not used in Andalusia, where the majority of the settlers originated. Thus it may be that the dula was introduced from above, by the governor or some agent, during the process of institutionalization and adulamiento. If this was the case, then the administrator or officials in question must have operated with the knowledge of southeastern, rather than southern, Spanish systems in mind. The secuestro seems also to be of eastern Spanish origin, although the term itself is a purely Canarian usage. In Novelda, a town near Elche where water is private and places in the turn are sold at auction, five days
of each turn are reserved for expenses of the employees of the irrigation community and for upkeep of the canals.\textsuperscript{54}

Therefore, the case for direct institutional continuity between the irrigation systems of eastern Spain and the Canaries is, at best, circumstantial. Many of the similarities can be easily attributed to common acceptance of late medieval notions of water rights, on the one hand, and homologous reactions to similar hydrological situations, on the other. However, on the basis of study of both areas, the distinct impression conveyed is that the constellation of elements in the institutional configuration is articulated in basically the same way, lending credence to some direct link. The Canarian systems remind one of Alicante, Elche, Novelda, Lorca and Moratalla — not of Granada or points west.\textsuperscript{55}

\textbf{Irrigation in San Antonio}

The history of the Canary Islands has been subtly interwoven with that of the New World, not only as a constant source of immigrants, but as a laboratory where institutions and technologies introduced into the Indies were first tried out; the Canarian world of the late fifteenth and early sixteenth centuries was a prefiguration of colonial society in America.\textsuperscript{56} Endemic poverty and hunger, especially in Lanzarote, Fuerteventura and Gran Canaria, assured the continued existence of a pool of prospective emigrants in search of a better life. The feudal structure of the first two islands, compounded with chronic agricultural failures, placed such onerous burdens on the peasants, that pulsating migratory currents resulted in bringing refugees from the poorer to the richer islands and, then, to settlements in the Indies.

The importation of Canarian technicians was a hallmark of the nascent American sugar industry. It is a sign of the rapid and intensive development of this industry in the Canaries that a pool of surplus technicians was available to man the cane plantations and mills of tropical America. The first Canarian technicians departed for the New World in 1519 and soon appeared in Mexico, Santo Domingo and Puerto Rico as builders of \textit{ingenios} and mayordomos of plantations.\textsuperscript{57}
In the eighteenth century the migratory flow became a torrent. Between 1720 and 1731 about 800 persons, mainly farmers, departed for Puerto Rico alone and the records of embarkments show numerous other groups leaving for Santo Domingo, Mexico, Florida and Texas between 1720 and 1764. These emigrants were nearly always of impoverished, agricultural background and many times included vagrants and ne'er-do-wells whom the insular authorities were anxious to rid themselves of. Conditions were so bad, and the masses of poor crowded into the cities so voluminous, that the crown finally decreed the forced emigration of yearly quotas; more still emigrated clandestinely.58

This dreary background sets the stage for the settlement of San Antonio. Orders were issued in 1723 for the settlement of 200 Canary families in the province of Texas. After a number of plans were aborted, fifteen families including fifty-six men, women and children finally arrived at Vera Cruz on June 19, 1730. It was substantially this group which reached the Presidio of San Antonio de Béjar on March 9, 1731.59

In our attempt to trace the origins of the water distribution of San Antonio established by the settlers, it is important to ascertain insofar as is possible their places of origin in the islands. Of the fifteen heads of families, all but seven were natives of Lanzarote, an island where irrigation was unknown. Of the seven from irrigated islands two (Antonio Rodríguez and Manuel de Niz) were from Gran Canaria; three (Juan Álvarez Travieso, Felipe and José Antonio Pérez) from Tenerife; and two (Francisco de Arocha and José Padre) from La Palma.60 Although it is possible that some of the Lanzarote families had worked on irrigated farms in Gran Canaria or Tenerife prior to their emigration, we can be positive only that seven settlers (and the wives of those who were married) were familiar with irrigation agriculture. If in addition, as I hope to demonstrate, the arrangements adopted by the Canarians were of a strongly Gran Canarian cast, then the factor of selectivity in institutional diffusion assumes dramatic proportions.

The fact that most of the settlers were from Lanzarote, however, merits a brief digression on the agricultural economy of that island
in the period preceding the migration. The agrarian environment which the settlers had previously known and that which they created on the banks of the San Antonio River could not provide a greater contrast.

Lanzarote was settled by Norman peasants in the early fifteenth century. There they scratched out a meagre living from the parched soil, paying onerous dues to feudal lords. The economy of the island, like that of its neighbor Fuerteventura, was based on a double system of cereal farming and stock grazing. But these two activities, neither of which could have been supported alone by the island's scarce resources, were mutually destructive. The agricultural returns were so low that farmers felt constant pressure to extend their fields, which could be done only at the expense of pasture. The rapacious and frequently starving sheep and camels, which constituted the herds of the island, were forever trying to break into the sown fields and devour the crops. Interestingly, it did not occur to these peasants to fish for a living until the nineteenth century. They lived with their backs to the sea, depending on it for food only during times of severe famine when they would camp along the shore and eat shellfish.

Inasmuch as it rains but twice or three times a year on Lanzarote, the island's agriculture was, as Roldán pointed out with regard to Fuerteventura, a fount not of wealth, but of poverty. The trade patterns of the island system also contributed to famine. Inasmuch as all the islands grew the same export crops (cereal grains and sugar) and had similar climates a good year for one was usually good for all; hence the surpluses brought low prices. In bad years prices were high, but no one had anything to sell. Moreover, the señorío islands were taxed heavier than those of realengo, eating up the farmers' money supply and leaving nothing with which to buy seed.61

The peasant cultivators could anticipate an average of only two good years each decade, two or three which were passable, and the rest completely sterile. Three or more bad years in a row ended in generalized famine, followed by emigration. The famine of 1721-23 (doubtless the direct precipitating factor in the departure of the
San Antonio settlers) was the worst yet recorded. It began in 1721 with a desolating hurricane; crops were ruined and the peasants began to die of starvation. In March of that year the cabildo of Gran Canaria had to ban further immigration from Lanzarote and Fuerteventura, so great was the migratory pressure. In October 1722, more hurricanes ravaged the desert islands destroying what few crops were still standing. There was no let-up as drought continued for the rest of the decade. In addition, the island's volcanoes showed signs of erupting. From 1726 to 1729 many people from the interior of the island crowded into the capital Arrecife, living in wretched hovels and hoping to be allowed to leave. Finally, on September 1, 1730 (long after the San Antonio group had left) a series of devastating volcanic eruptions began which by 1736 had covered a third of the island's surface with volcanic ash.62

To people who had lived in such an impoverished environment, San Antonio must have seemed like the Garden of Eden. The Spanish presidio had been established on the San Antonio site because of its copious water sources, notably the San Antonio River and San Pedro springs.63 From these sources, the islanders and the missionaries constructed seven irrigation canals in the course of the eighteenth century (see map). The missions of Concepción, San Juan, San José, San Francisco de Espada, and San Antonio de Valero each had an irrigation ditch. The waters of the first four were, until the secularization of the missions in 1794, destined to the exclusive use of the Indian farmers hosteled on the mission grounds. The canal of San Antonio de Valero, later called the Alamo Madre Ditch, was also used to a certain extent by the townsmen. The San Pedro canal, drawing water from the springs of the same name, was constructed in the 1730's for the exclusive use of the Canarian settlers. This was usually referred to in the documents as the asequia madre or the "canal which crosses the city" (la asequia que atrabiesa la ciudad) and, in a later period, the Main Ditch. It watered fields in San Antonio from at least 1735 until 1906. The last canal, called the Upper Labor, was constructed in 1777, also for the use of townsmen (the new settlers from Los Adaes) and its remains can be seen today in Brackenridge Park. In this study, we
IRRIGATION CANALS OF SAN ANTONIO

LEGEND

Acequias

1. Concepción Acequia
2. San Juan Acequia
3. San José Acequia
4. Espada Acequia
5. Alamo Madre Acequia
6. Upper Labor Acequia
7. San Pedro Acequia
are interested only in those canals which came under the direction of the cabildo, that is, the two last named — particularly the San Pedro Ditch — and the Mission Canals only after secularization when they too came under municipal control. The earlier history of the mission irrigation systems is covered adequately elsewhere.\(^6^4\)

The documentation on irrigation in San Antonio prior to Texas independence is so meagre and discontinuous that any research into this area takes on the countenance of historical detective work. For the eighteenth century instead of detailed descriptions and compendious ordinances, we have only the slightest passing hints about the nature of distribution arrangements. Even those few documents which deal directly with the subject are characterized by vagueness and lack of detail. In the late Mexican period, when city council minutes began to be kept in English as well as in Spanish, there is more copious documentation, or, more accurately put, there are stronger hints, but ample room is left to the imagination. It is my basic historiographical assumption that these hints can be pieced together into a coherent picture of irrigation customs in colonial San Antonio only in the context of Canarian practice. Comparative study is not simply a complement to our understanding of colonial society in San Antonio, it is absolutely essential. We cannot hope to know how the settlers irrigated without understanding what specific ideas concerning water use they had in their heads when they arrived.

As a working method, I have regarded any relevant document in the Spanish and Mexican periods as fair game, utilizing the later references on the assumption that they may well provide information describing institutional arrangements put into effect considerably earlier. Agricultural practice is extremely conservative. Arrangements which work effectively are not abandoned until and unless some technological or environmental change forces a new adaptation or direction. In the San Antonian irrigation system change came late — after the Civil War — with demographic growth and intensification of well-drilling as the primary variables.

In addition, I have found the study of twentieth century prac-
The Old World Background of the

practice in the Espada Ditch system to be useful in establishing the persistence of two characteristic elements of Canarian irrigation practice, the dula and the secuestro, whose very survival underlines the essential conservatism of irrigation arrangements. The exposition which follows seeks to explore only the most basic facets of irrigation practice in San Antonio: (1) the development of a municipally-controlled canal network; (2) the nature of the irrigation turn; and (3) the question of water rights and the privatization of water. These major institutional features will be shown to have received a strong Canarian impress.

In shifting from gully to river irrigation, the islanders were faced with the elaboration of a two-tiered institutional network. In the islands, putative upstream competitors of heredamiento irrigators were barred from the use of water by denial of water rights. In river irrigation other riparian users (in this context, I refer not necessarily to individuals but to corporate users, such as all the irrigators of one canal collectively) also had claims to the river’s water. In the case of San Antonio a competitive system evolved with the townspeople (two canals) in league against a coalition of the mission irrigation systems (five canals). This situation is reminiscent of such Spanish systems as those of Valencia or Castellón where various municipalities had to share the water of the river among each other. Again, as in the two mentioned river systems, a coalition of weaker entities (the missions) brought suit against the town, as the most powerful irrigating party in order to apportion the water fairly among all in times of scarcity.

No sooner had the islanders arrived than Gabriel de Vergara of the Concepción mission wrote to the viceroy as spokesman for the five missions expressing anxiety over the distribution of river water with the new settlers. The viceroy, the Marqués de Casafuerte, replied from Mexico City on Christmas 1731 refuting Vergara’s arguments, avowing that it would be lamentable to abandon the Islanders without water, especially since the government had spent so much to bring them over in the first place. Casafuerte stated that the water had been deemed as sufficient for all and suggested that prejudice to the missions’ supply could be avoided by “divid-
Vergara's apprehensions were not entirely misguided, however, in view of the Islanders' querulousness (which later became notorious). The Canarians argued over water not only with the mission fathers, but with the vecinos agregados, other Spaniards and Mexicans residing in San Antonio who in fact outnumbered them but who had little power inasmuch as under the terms of the settlement charter the cabildo offices were monopolized by the Canarians who held lifetime appointments as regidores. In a petition of 1745 the agregados complained that they "have continued to endure the domination that the Islanders have tried and are trying to establish there [and which they have carried] to the extent of depriving them of the water necessary for their homes." In this document, it is claimed that the Islanders did not represent the best and most desirable elements of Canarian society and that they were "rebellious, captious, and perverse" by nature.

On October 19, 1732 (to resume the narrative) the cabildo wrote to the viceroy claiming that "the water of the Arroyo de San Pedro was not sufficient for the irrigation of their fields, and for that reason they were losing their crops." Casafuerte (in May 1733) alluded again to his order for the water of the San Antonio to be divided proportionately ("se repartiesen proporcionadamente") among the families and missions and added that this order had not been carried out owing to the objections made by the president of the missions. The cabildo's petition had been sent to the military commander of the presidio, Pedro de Rivera, for his opinion. Rivera had given one opinion on December 10, 1731, and now on January 8, 1733, he replied that he still favored proportional distribution ("se repartan a proporcion") of the waters of the river and arroyo among the missions and families. He further stated at this time that in his view the streams from the two sources flow together a short distance from the presidio, yielding enough water to supply the fields of both parties. I assume that in both of the above cases the officials favored distribution of water in proportion to the area of irrigated land held by each party.

The viceroy quoted Rivera's opinion and added that "In regard
The Old World Background of the Canary Islands
Irrigation System of San Antonio, Texas

TENERIFE

Puerto de La Cruz

La Laguna

Santa Cruz de Tenerife

Pico de Teide

Guimar

Mountains

0 5 10 15 20 Kilometers
to the distribution of the water, it shall be done with the clear understanding that in case there is an insufficient supply for continuous utilization, it shall be used by turns, according to law 11, chap. 17, book 5, of the *Recopilación de Indias.*" The section of the Recopilación alluded to, incidentally, was not quite appropriate to the San Antonio situation. It stipulates that where Spaniards have taken over a native irrigation system (as in Peru, for example, or in the pueblos irrigating from the Rio Grande in New Mexico) they were to observe the Indian customs regarding division of water. Nevertheless, it was a precedent for the establishment of turns which could be, and was, invoked in other circumstances.

Vergara then wrote to the governor on May 20, 1732, that the viceroy had misconstrued his complaint. He had not been opposed to giving the settlers water, but had suggested that there was quite enough in the Arroyo de San Pedro to meet their needs and that, therefore, the water of the river should be left to the missions. In times of scarcity — should the viceroy's order be carried out — the water of both the river and arroyo would have to be divided into six equal parts ("seis partes iguales") that is, I assume, one share for each mission and one for the town. The town's position, as expressed in a petition by the chief regidor Juan Leal on May 28, 1732, was that the town and the missions should have equal shares, that is, I again assume, half the water for the town, the other half for the missions.

On August 1, 1733, the Governor of Texas, Juan Antonio de Bustillo, stated that he was ready to obey the order to distribute the waters, and on October 19 reported that he had inspected the volume (caudal) of water and was able to verify that there was enough to supply all five missions and the town in abundance. He authorized the settlers to draw water from the San Antonio River "at whatever point may be convenient for them to do so, from the site of the present settlement to its source," and to draw an equal amount from the Arroyo de San Pedro, "and no more." The rest of the water was to be left for the use of the missions. On the same day, Bustillo informed Vergara that the distribution was to take effect. Vergara replied that he had no objections for the present,
but added that if at some time in the future the volume of water in
the river should diminish to such a point where the missions were
not being supplied with their just share, he would reassert the
prior rights to the water which the missions had in preference to
the town ("según la antelación que dichas misiones tienen a la
dicha villa"). Vergara continued, stating his opinion that the pro­
posed division in conditions of low water would not be practicable
because the Indians of the missions would be obliged to wait until
twenty or thirty villagers had taken their turns ("no podrán aguar­
dar los pueblos a que riegan diariamente biente o treynta, o más
vecinos que puede tener dicha villa").

On October 27, 1733, the municipal officers held a ceremony on
the shores of the river to symbolize their taking of formal posses­
sion of the water. The matter was thus settled for a while, but no­
where in this series of documents is there any specific mention of
the time or proportions involved in the partition. Nor is it clear
whether there was an irrigation canal in operation at this time, or
whether no canal could be dug until the formal ceremony of pos­
session had taken place. In any case, the missions and not the Is­
landers had their way for the time being and the town drew water
from San Pedro Creek alone for the use of their fields. Tension with
the missions continued, but subsequent strife was centered in the
further granting of land to the town. (Since the land would have to
be irrigated, though, demands on the water supply underlay the
struggle.)

The dates of construction of the San Pedro ditch are not docu­
mented, but the canal seems to have been in operation by 1735. On
April 14, 1735, Juan Leal ordered the alcalde of the town to see that
the irrigation ditches of the town fields were repaired within eigh­
teen days, so that there would be no loss of water. On May 2, Leal
complained that the order had not been carried out, specifying
that the townsmen "shall place in operation the mother canal (ace­
quía madre) which receives the main flow of the water from the
San Pedro Arroyo for the benefit of the lands which were then
being placed under cultivation in the pasture of this villa, so that
there would be an abundance of water for the cultivation there-
of.70 It seems clear that the main canal was, at the very least, under construction at this time.

By the following year, a turn was already in effect. In January 1736, the cabildo wrote to the viceroy concerning the increasing pressure on the water supply of San Pedro Creek due to grants of land to new settlers:

At the request of some other subjects who asked to be settled in the same form in which these were distributed to the first Canary Island settlers, the governor ordered that the same should be given to them from San Pedro spring and arroyo, paying no attention to the fact that its flow does not amount to a buey (measure) or to the fact that the fields of the Islanders are so small that they have scarcely been able to plant eight almudes of corn apiece and that they cannot irrigate them because it falls their turn only once every twenty days.71

These new settlers, the document continues, had to rent four days of water belonging to the villa lands in order to cultivate their fields. (When land was originally granted for a settlement, one fifth of the land within the municipal bounds was reserved as the property — propios — of the cabildo; therefore, the cabildo also owned one-fifth of the water in San Pedro spring. This water was rented or leased, as will be amply discussed below.) This document demonstrates that a turn was already in effect in 1736 and that the cabildo was participating in it as well, through the sale of propios. The parcels granted to the settlers generally ran between the creek and the river, although the rights were only to creek water. It is conceivable, therefore, that the turn was on the creek and referred to a rotation between the turn-outs of the individual parcels. This would have meant that each landholder would have had to have built a diversion dam and dug canals. It seems more likely that the San Pedro ditch was already in operation.72 If the new settlers had four days in the turn (representing the town’s fifth of the water rights) the Islanders would have had sixteen days in a twenty-day rotation.

The fact that a turn was in effect as early as 1736 suggests that, just as in the Canaries, the first dula may have been imposed by the governor. It is intriguing to note that Carlos Benites Franquis
de Lugo, governor in 1736 and 1737 was a native of La Orotava and had been a Deputy Intendant of the Canary Islands. Although there are no known dispositions of Franquis relating to irrigation, he may well have inherited the aforementioned complaint from his predecessor Sandoval, whom he replaced in September, 1736. Furthermore, Franquis' well-known opposition to the missions may well have led to his intervention in water matters on the side of the townspeople, his countrymen. The fact that the equivalence of one dula to one day of water in San Antonio (see below) is suggestive of the usage of Tenerife may correspond to the participation of this official in the process of institutionalization of distribution practices during the formative early years of settlement.

In Samuel M. Buck's account of the Canary Islanders in San Antonio much is made of the role of the town's first mayordomo, Antonio Rodriguez, in the development of irrigation. Buck's material is, apparently, based largely on oral tradition recorded around the turn of the century from Francisco Calistro de Arocha whose great-grandparents Francisco de Arocha and Juana Curbelo were among the original settlers. (The elder Arocha was born in La Palma in 1703 and, being the only one of the settlers who was literate, served as first clerk — escribano público — of the town.)

According to Buck, Rodriguez was a native of the village of Tamaraceite in Gran Canaria where he had been involved in irrigation activities as a youth, repairing canals and patrolling the barranco with his father. One one occasion, the narrative continues, his father had been severely injured "while repairing a break in the canal to prevent the residents of Las Palmas from suffering a water shortage." The details of this tale may have been novelized, but the general framework is believable. Tamaraceite is a village south of Las Palmas which irrigates from the same Tejeda waters which flow on to the city.

Antonio Rodríguez was around eighteen years old when the settlers arrived in San Antonio. In spite of his youth, he was named town mayordomo, an office which encompassed the management of public funds and the general supervision of public works within the town. In the early 1730's (again following Buck's narrative),
The Old World Background of the

Rodríguez was recruited by the head of the newly relocated Concepción Mission to direct the construction of that institution's irrigation canal, on the basis of his previous experience in such matters in Gran Canaria. Finally, around 1739 (sic), Rodríguez was called upon again to direct the building of the San Pedro Ditch. The direction of irrigation works during the crucial first decade of development by a man from Gran Canaria might in part explain the prevalence of Gran Canarian elements in the customary distribution arrangements adopted by the townsmen.

The Dula in San Antonio

The earliest direct reference to a turn on the San Pedro Canal appears in a document of 1750 dealing with irrigation development on the San Xavier River, where — it was thought — there was not enough water to serve both agricultural and domestic needs. The counter-argument was based on the experience of the San Pedro Canal which was able to water a like area with even less water: "... the short gully of San Pedro from where the Islanders draw a canal with less volume; it is enough for fifteen partners, without [including] another five days which are assigned to the propios of the town." It appears here that the fifteen cited shares refer to the parcels of the original settlers, who were able to supplement their basic right by renting extra hours from the cabildo. This evidence confirms the early existence of a twenty-day turn.

More information comes from later documentation. From municipal ordinances and from dispositions of the city council in the 1840's it is clear (1) that distribution arrangements on the main ditch were in the direct purview of the council and (2) the turn was known by the name dula. The "Ordinances for the Better Regulation of the Water" issued in Spanish and in English on January 17, 1840, stipulate that "In due time the water of the said ditch (i.e., San Pedro) shall be apportioned between the labores (fields) below the town and the town itself, and the days and hours upon which they shall be entitled to the water." The Spanish version of "apportioned" is "puesta en dula." The labores below the city apparently refer to parcels in the service area of the San Pedro Ditch,
although it is conceivable that it refers to parcels on the river, in which case on those days the water of the canal would run through until it flowed into the river.

That the council actually used its power to ensure the town’s water supply is documented by several entries in the minute books. On March 26, 1840, the mayor informed the council that he had put the water in dula “since last Sunday the 22nd inst. with the reservation of the 5th which belongs to the City which begins on Thursday the 26th inst. a little before sun set.” A council disposition of May 15, 1847, is more detailed:

Be it ordained . . . that the water of the Main Ditch running through the town having been regulated by the Commissioners appointed for that purpose, this is to inform all interested, that from and after the 1st day of May the water commenced in dula, the labors being entitled to four successive days from the first at sunset; the fifth day it is for the use of those entitled to the same in the city, that is to say, for every four days it runs free through the town for the labors, the fifth for the city, and so on through the year. It is also a duty incumbent upon those entitled to water in the city to meet and elect a person from among their number to divide the time between the different gates so that every person can know their time when they are entitled to the water, as by this method all difficulties can be avoided.

The actual organization of the dula can be approximated from data relating to distribution of water on the five mission canals, after the secularization of the missions. The mission land was made available for Spanish and Mexican settlement and the entire organization and administration of the lands and waters was placed in the hands of the governor. However, it is quite clear from the documents that a homogenization of practice had taken place in San Antonio and the usages of the main canal now were extended to encompass all the canals of the city. There is evidence from the 1820’s and 1830’s that water in all five mission systems were apportioned into dulas. The earliest reference to the word dula in a land conveyance is from 1808 and the earliest reference to the word dula known to me is from a document of 1791 where the surveyor Pedro Huizar reported in a reconnaissance of irrigation possibilities at La Bahia (Goliad) on the San Antonio River that certain
sites were unfavorable, inasmuch as there one would have "to draw four dulas" from the river in order to use one, owing to the sluggish current of the river. 83 One cannot hazard a guess as to how much water Huizar understood a dula as conveying; perhaps he meant it only in a general proportional sense, which would be the correct usage.

Land conveyances in the 1780's start to mention water rights in specific time units associated with each parcel or suerte conveyed. It is clear that these time references refer to hours in a turn. Thus we find grants within the limits of the town for twenty-three hours of water (exchanged for a right of sixteen hours in 1782), two suertes with twenty-four hours of water in 1788, one-half suerte with eight hours in 1792, and another two suertes with twenty-four hours in the Upper Labor in 1801. 84

By the 1820's subdivision of parcels and adscripted rights had reached the point where rights were stipulated in minutes, such as the grant of "one parcel (heredad) composed of four hours and forty minutes of water, with its corresponding fields." 85 Note here not only the use of heredad which is reminiscent of Canarian usage, but also that the conveyance is of water with land adscripted to it.

Another conveyance, dated 1823, gives an idea of the shape of the dula on the Upper Labor canal, when a woman was granted three specific dulas or days of water:

The days of water are, the first of dulas, one on the 9th and one on the 21st, as is the custom observed in the said labor. Each dula of water consists of 24 hours and in this form I grant her the three dulas. 86

Dula here is used in two senses: (1) as a measure, equivalent to one day of water; and (2) the turn as the total of all the composite dulas. In addition, the word seems occasionally to have added a third connotation, due to the adscription of water to land: the dula as a land measure. In 1830, one Antonio Garcia of the San José system complained to the city council that he was unable to plant the half-dula which the government gave him. 87 He was probably granted a half-suerte, because there appears to have been an equivalence in the earlier grants cited above between one suerte and one dula. The "day of water" varied in actual value. On the Upper
Labor a suerte generally had twelve hours of water; on the mission ditches after secularization there was the equivalence of 1 suerte equals 1 dula equals 24 hours of water.

In the 1820's the city appointed a commissioner who was responsible for collecting the rent of the water from the extinguished missions. The owners were charged a flat rate which at times appears to have been a service charge and at others a straight tax. The collection records for 1824 reveal a twenty-five day turn on the Concepción Ditch (with only ten landowners, however), twenty-two on the San José Ditch (nineteen owners), twenty-five on the San Juan Ditch (twenty-one owners), and twenty-six on the Espada Ditch (twenty-six owners). The norm on all these canals, which were relatively short, seems to have been a turn of twenty to twenty-five days.

Only two of the seven canals have survived to the present, San Juan and Espada. The custom of the Espada system is particularly revealing and is recorded in the Minute Book of the Espada Ditch Company, which is complete from 1894 to the present. The Espada Canal fell into disuse around 1880 and was revived in late 1894 by a group of interested landowners. The turns were organized in fifteen-day cycles. The Minute Book reveals a curious vestige of Canarian practice: it was the practice of the Ditch Company from the refounding of the canal until the 1950's to sell one or more days in the turn to meet the maintenance expenses of the canal. Sometimes, it was the water of the thirty-first; sometimes, the first and the sixteenth, and often extra hours (as when one parcel was not being farmed) were also put up for auction to the highest bidder. This practice, of course, is precisely the Canarian secuestro (although that term is not known) which was supplemented by a yearly assessment per hour of water right.

Some of the irrigators of the Espada system recall hearing the word dula. During one period recently when the formal turn had lapsed and irrigators were taking water at will, one irrigator demanded that fixed times be reinstated, claiming: "I want my dulas!" On other occasions men would appear at the house of the secretary to pagar las dulas.
As a postscript to this shadowy history of the dula in San Antonio, it bears noting that there were at least two other related systems in the general vicinity. The village of Santo Domingo de Hoyos, one of the Escandón colonies of Nuevo Santander, founded in 1768, also appears to have had a Canarian-style irrigation system. Eighteenth-century documents record twenty land grants with specified dulas or días de agua, along five irrigation canals. Likewise, the sections relating to irrigation in the municipal ordinances of the town of Morelos (Coahuila) adopted in 1830 reveal a similar usage: the water for irrigation was to be divided (adulada) proportionally and turn-outs were to be opened by each individual according to the dula attaining to him.92

**Municipal Direction of Water Distribution**

Control of irrigation in San Antonio was the mutual responsibility of the governor and the cabildo, with extensive overlap in jurisdiction. (Of course, the missions controlled their own affairs until they were secularized). Throughout the Spanish period, insofar as the scant documentation allows us to judge, the municipally controlled canals were notably under-administered, by comparison with any Spanish or Canarian system. The documents record the appointment of only two acequieros — the standard Spanish irrigation official — both on the Upper Labor ditch in the 1770’s. The election of such an officer was decreed, in this case, by the governor at the time of the construction of the ditch. The acequiero was to be elected by the irrigators and was to inspect work on the canal daily. After 1781 there are no further mentions of this official.93

The ordinary direction of irrigation on the town canals was entrusted to the cabildo, and particularly to the mayordomo and alcalde — this latter, a judicial and police officer who issued the municipal ordinances. Thus in 1752 alcalde Francisco Delgado, in view of damage caused by stock-herders driving their cattle across irrigated fields in order to water them in the Acequia Madre, authorized the mayordomo “to prevent anyone except those with hereditary rights to get any water from the Acequia Madre except on the day when he is legally entitled to it.” In addition, the mayor-
domo was, in order to carry out royal provisions and prevent the waste of water, to inspect turn-outs and prevent the implanting of checks in the canal. A fine was set as penalty for infringement of this decree. Similarly, in 1760 alcaldé Alberto López Aguado included among various regulations for the good conduct of the citizenry the disposition that no one should allow their animals to befoul irrigation water, owing to the danger of disease, and that no herds should be driven into the town because of the threat posed to the main irrigation canal. In 1775, alcaldé Amador Delgado ruled, among other dispositions, that “Clothes shall not be laundered in the acequia of the town. The woman or person found washing [there] shall be dispossessed of the clothes being laundered in the said acequia.” These are standard rules, found in all Spanish irrigation systems. What is peculiar is that no more detailed regulations were laid down for eighteenth century irrigators.

Nineteenth century regulations were more explicit and more detailed. Various chapters of the municipal ordinances of 1829 dealing with public health, public safety, and the town treasury contain irrigation regulations. The main canal was to be cleaned each February and water was not to flow again until it had been inspected by the chief of police, and fines were levied against those who befouled the water of the ditch. In 1840, after the San Pedro Canal had fallen into a state of ill repair, extensive ordinances were passed to get the system in working order again. Most of the regulations have to do with the responsibilities of irrigators in keeping the ditch in repair. If individuals failed to carry out their share of maintenance, they forfeited their water for the use of the municipal corporation for one year. Included also were specifications regarding diverting water and placing checks in the canal, the setting of turns, the election of a ditch commissioner, and the levying of fines for contravening the ordinances.

In spite of the council’s sporadic efforts to regulate irrigation practice, there is evidence to the effect that the responsibilities of the irrigators and those of the council were never clearly delineated — another aspect of the underadministration to which I have alluded. For example, the irrigators of the Lower Labor — the fields
on the San Pedro Ditch below the city — complained in 1822 that the council not only did not contribute its fair share to the upkeep of the canal but even that they were obliged to do the city's job in order to ensure continued irrigation. That is, the city held one-fifth of the water rights but did not contribute a commensurate amount of aid in maintaining the channel. 96

The relative poverty of administrative norms for the control of irrigation in colonial San Antonio is related to the relative infrequency of conflict in irrigation. It was only as the town began to grow that the cohesiveness of the traditional arrangements, which had been largely self-regulating, began to be challenged — for example, it was only in the 1820's, and increasing in seriousness thereafter, that pollution of the irrigation water by urban users forced the town fathers to take increasingly stringent measures to prevent the fouling of the water. 97

The lack of conflict, which explains to a large degree the lack of regulations, can in turn be explained in terms of a number of contributing factors. Canute Vandermeer suggests a number of propositions which define the susceptibility of a given irrigation system to the genesis of conflict over water. 98 A number of these propositions seem particularly appropriate to the case of colonial San Antonio. In the first place the canal systems were rather small, both in length and in the number of users (an average of around twenty-five per canal). Vandermeer proposes that "the fewer the farmers served by a channel, the more likely it is that more farmers will know each other personally, and the fewer are the thefts and conflicts." The internal cohesiveness of the San Antonio systems seems to be the major factor in the relative lack of conflict between irrigators. Vandermeer also states that "the more is the cooperation required to obtain water, and the greater the spirit and tradition of cooperation among farmers, the fewer are the thefts and conflicts." The irrigators of the San Pedro Ditch — the Canarians and their descendants — had been raised in a tradition of community responsibility with regard to irrigation, the Canarian tradition and that of Spain generally. These attitudes are generalized and deep-seated in Spanish culture and usually went unchallenged.
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Significantly, one of the few recorded instances of stealing water involved complaints in 1844 by rightholders against German and French immigrants who were irrigating gardens from the Main Ditch without having the right to do so.99

The cohesiveness of the San Antonio irrigation communities was due not only to tradition, but also to the solidarity-inducing conditions of frontier environment where irrigators were obliged to request guards to protect them from marauding Indians while carrying out their labors.100 In this kind of situation stealing water from a neighbor would not be worth while in view of the potential loss of security provided by group solidarity.

Four of Vandermeer's propositions relate to the influence of water supply and water rights on the genesis of conflict. With regard to the former, the greater is the sufficiency of water and the less the inequities in water supply, the fewer are the conflicts. Moreover, the better defined are the water rights and the less the inequities in their allocation, the fewer the conflicts. In San Antonio the creek and the river supplied the city's needs amply; therefore there was little friction among the seven canals after experience had allayed the initial fears of the missionaries. Moreover, both water and rights were apportioned equally and equitably (by the suerte, or lot method, and through the implementation of the dula) within each system. Water was distributed proportionally according to the amounts of irrigable land held, and the parcels were, initially, fairly equal in size. Therefore, conflict between members of the same canal system was negligible. Conflict did arise, however, between rightholders and outsiders (the vecinos agregados of the eighteenth century and newly arrived immigrants of the nineteenth) who had no rights.

Clearly the principal factor governing the absence of conflict was the water supply itself. (The abundance of water relative to demand is attested by the lack of frequent citations of drought during the eighteenth century.) In a situation where there is on the whole an ample supply, it is not reckoned worth the possible adverse social consequences to steal water on those relatively infrequent occasions when water is short. How different is such a situa-

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tion from that attaining in the Canary Islands, where the water supply was habitually meager, and where in-system conflict was endemic (e.g., the proverbiality of the *cantonera ladrona*). In such a situation the economic benefits were great enough to make it worth while for a farmer to risk altering a divisor in his favor. The fine structure acts in such a situation to legitimize the economically necessary stealing of water and lends greater flexibility to the system.

The social situation of the eighteenth and nineteenth century canals can be appreciated from observing the functioning of the Espada Ditch Company in the present century, a canal system which may be said to have functioned from 1894 to the present *without any sanctions* save the pressure of the group of irrigators. The administration of the company was officially in the hands of seven directors, elected for three-year terms. Day-to-day arrangements were entrusted to an elected Ditch Commissioner whose main tasks were to draw up the rotation lists and to supervise the yearly cleaning of the canal. The enforcement of the regulations was left to the individual irrigators. When I asked an old farmer how the enforcement of turns was achieved in the early decades of the century I was told:

> Everyone had to do his own prevention [of theft]. You really had to fight for the water. If someone was not finished irrigating and it was your turn, you came up the ditch with a shovel on your back.¹⁰¹

The shovel, to be sure, was not to hit the man over the head with, but to knock out his gate. My informant said that typically a show of belligerence would suffice and the other fellow would end the incident with some lame excuse for his tardiness in releasing the water. By 1971, when I talked with some of the irrigators, the institutional framework, informal as it was, had fallen apart completely, owing to lack of interest of those few irrigators to whom agriculture was still profitable. Everyone was taking water at will, and the company had not had any power of enforcement within anyone's memory. Thus, someone was caught tampering with the lock at the aqueduct but no punishment (in this case, the denial of water — a fine would not have been collectable) could be meted
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out. The company had even had to assume responsibility for the maintenance of the entire canal, since members were unwilling to maintain even their own frontage — one of the cardinal principles of Spanish irrigation custom.\textsuperscript{102}

The experience of the Espada Ditch Company over the past seventy years reveals the essential social dynamics of irrigation arrangements in San Antonio, which were based on traditional concepts of water distribution introduced by the Spanish settlers (and reinforced by the civil law) and which functioned not through administrative and judicial rigor but through group solidarity, a situation made possible by the relative abundance of water.

\textit{Sale of Aguas de Propios}

Much of the town council's interest in irrigation centered around the \textit{aguas de propios} which included the original rights to one-fifth of the water of San Pedro Creek and, after the secularization of the missions, the water of the five mission canals, although these were distributed in a different manner.

The municipal ordinances of 1829 provided for the creation of municipal income to be deposited in a \textit{fondo de propios} belonging to the city.\textsuperscript{103} Part of the income of this fund was derived from a tax of one \textit{peso} to be collected annually from "each one of the proprietary owners of the days of water into which are divided the diverse conduits (\textit{sacas}) which comprise this municipality."\textsuperscript{104} The collection of this tax was called the \textit{censo de dulas y propios}\textsuperscript{105} and there are records of its collection from the irrigators of the canals of the "extinguished missions" from the 1820's through the 1840's.\textsuperscript{106} This water was considered the property of the municipality, and this phenomenon was unique enough to have attracted special mention in the debates of the Second Constitutional Congress of Coahuila and Texas in 1829.\textsuperscript{107}

It is fairly clear that the mission water was appropriated by the city and regarded as having the same legal status as the water comprised by the city’s fifth of the San Pedro water. (The records make it clear that in the early nineteenth century all water users in the city, \textit{except} the holders of rights on the Main Ditch, were paying
the censo de dulas.) However the documentation concerning these original aguas de propios is scant indeed. From the passing allusions cited before in this essay it seems that throughout the eighteenth century the city's fifth was available for rent for the use of those irrigators on the Acequia Madre who wished to supplement their dula or who had no adscripted rights. The 1829 Ordinances refer to the distribution of mercedes de agua as being within the purview of the town's neighborhood commissioners. These mercedes are probably the original aguas de propios of the San Pedro Ditch. (Merced de agua, a usage which we have observed in the case of the grant of Tejeda water to the city of Las Palmas, refers to regalian or patrimonial water which is subject to distribution, free or otherwise, at the discretion of the owner, usually a public corporation.) A very late reference indicates that the city's share of San Pedro water was allotted by the month. In any case, in spite of the meager documentation, there is enough evidence to warrant the tentative conclusion that the Canarian settlers introduced as part of their ideas of municipal administration the concept of patrimonialized water, so typical of the islands. The alienation of water rights by the town, discussed below, also bears on this problem.

**Water Rights and the Privatization of Water**

Water rights are a society's idealized assessment of the best way to utilize water resources, according to the objectives most highly valued by that society. There is a subtle interplay between rights and practice, between the ideal and the real; and there has been a tendency on the part of legalistically-inclined students of irrigation to over-stress the importance of rights in the over-all picture. At the inception of a given irrigation regime, rights are assigned according to the model prevailing in that society at the time. Thereafter the structure of rights does not generally affect the actual contours of the distribution arrangements subsequently evolved. At best the legal structure provides a framework in which arrangements are worked out. If subsequent practice proves, however, that the idealized assessment of resource utilization was incorrect, or inappropriate to the situation, the rights are altered — often with
resistance — to meet the exigencies of the environment.

It is clear when San Antonio was settled by the Canary Islanders that water was adscripted to the land. The early conveyances do not specify time allotments, it being assumed that the parcel carried with it the right to an aliquot portion of the debit of San Pedro Creek. Later, rights begin to be expressed in time-units, a process analogous to that of adulamiento in the Canaries. What is not clear is whether the San Antonio adulamiento was the result of environmental pressure or of social pressure (e.g., the Canarians wishing to make their rights more explicit, in accordance with Canarian custom). In any case, it is clear that by the end of the century some privatization of rights had been effected. By the early nineteenth century water rights were alienated as property apart from land, although to what extent privatization had gone is not clear. 10

Conveyances from the second decade of the last century show that water rights were to some extent alienable. In 1815 a lady named Concepción de Estrada left orders in her will that her right to one day of water be sold in order to defray the expenses of her burial. Another document of 1819 records the exchange of irrigation rights between two parties, who agreed that the said exchange pertained only to water and not to land. 11 Such examples could be multiplied. It seems unlikely, however, that water could be alienated outside the service area of the canal as originally constituted. Just as in the Canaries, to have done so would have destroyed the proportionality upon which the water rights of other landowners were based. Moreover, evidence from the Minute Book of the Espada Ditch Company indicates that it was the practice in the early part of this century to permit the limited alienation of water rights within the service area and even to alter the constituted service area providing that the original system of proportionality was maintained. In 1897 the directors of the Company granted Rosalino Diaz an extra twelve hours of water, changing his right from twenty-four to thirty-six hours, "provided that in granting the twelve hours extra, none of the original water rights shall be disturbed." This was in consideration (1) of remuneration for work performed in maintenance of the ditch in 1895 and (2) in view of
the fact that the original number of hours he held was insufficient to water his land.\textsuperscript{112}

Another practice in the Espada system was to sell the rights of one parcel if that parcel were no longer irrigated, as in 1908 when, at the annual meeting of the Company, a motion was made “to sell the water rights of the Jones place to the highest bidder,” but only for one year. This is entirely in keeping with the Canarian custom of selling unused water (sobrantes) to the highest bidder without thereby voiding the right of the owner of the water.\textsuperscript{113} In 1895 one irrigator applied to the Company to increase his irrigated acreage from 125 to 200 acres; but even though he was watering seventy-five acres which had formerly been excluded from the service area of the ditch, the extra acres corresponded to a similar amount of land of another owner which was no longer being irrigated.\textsuperscript{114}

A further indication of the limited patrimonialization of water in San Antonio are the repeated provisions for forfeiture of water rights in the case of non-compliance with municipal irrigation regulations. This again is similar to Canarian practice and contrasts with that of Valencia; rights truly adscripted in the title to the land cannot be forfeit in any way.

The fourth section of the ordinances of 1840 provided that if a man failed to perform his assigned work on the ditch his water right was forfeited for the use of the municipal corporation for twelve months. In April 1847 a motion was offered to the council providing that persons who fail to perform labor or pay their proportional part of the expenses of repairing the Acequia shall forfeit their “water privilege” for one year, the right for that year being sold to the highest bidder. In May of the same year the council ordained that whoever should not keep his channels in repair would not only forfeit his water but would have his turn-outs closed by the City Marshall “at their source from the Main Ditch.”\textsuperscript{115} In this instance, the city is stressing its basic control of the water and moving closer to voiding the right. A similar stricture was practiced more recently in the Espada system where in 1912 the company entertained a motion to give the commissioners a right to sell any water where a landowner fails to pay his assessment.\textsuperscript{116} Here
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I assume that the right would be restored the following year if the owner paid. In any case, such strictures were not made in the medieval Valencian system of public water where the tax (cequiatge) was purely a maintenance charge and did not impinge in any way upon the basic right.

These examples show that the San Antonio experience recapitulated, albeit imperfectly or incompletely, the process of privatization as had taken place earlier in the Canaries. The original grants were per regalia with water adscribed to the land, by suertes. Then, there was a process of adulamiento, completed in the second half of the eighteenth century, whereby the holder of a proportional right had his share made explicit in numbers of hours or days of water. Once this stage was reached, it then became possible to shift the rights around, and within a limited context to alienate them. The civil law tradition in Spanish Texas favored adscription, but Canarian custom favored a certain amount of privatization and encouraged the town fathers to regard the water of the creek increasingly as the patrimony of the town.

The Process of Diffusion

The transplanting of some idiosyncratically Canarian institutions of water distribution to colonial Texas suggests some observations on the process of cultural diffusion in the New World. George Foster has noted that the culture brought by Spaniards to America was to a certain extent a standardized, simplified and idealized version of Spanish culture taken as a whole.117 This is certainly true, but the impact of this idealized “contact culture” was largely felt through the mediation of formal mechanisms of cultural transmission such as the colonial administration. We see this in the case of irrigation, where the entire late medieval Spanish experience in the area of water rights and water distribution was compressed, simplified and codified in the Ley de Indias and similar compilations. It was this path that the researchers of the Texas Attorney General’s office took in order to support their position in the Valmont Plantations case. The scholarship produced, compiled as Appendices to the Brief of the Plaintiffs in that case,
was excellent and allowed the state to prove its point concerning the nature of riparian rights in Spanish law. However, this research concentrated on the civil law tradition and largely avoided another vast body of available evidence, that dealing with customary irrigation practice. It is important to distinguish between these two levels of the law, because (1) irrigators do not guide their daily activities by consulting legal tomes and (2) to concentrate on the civil law tradition exclusively is to obliterate the identity of idiosyncratic or regional elements which may prove significant.

In the case of San Antonio the civil law tradition played only a minor role and the institutions of water distribution were implanted through the authority (in all probability) not of the viceroy or governor, but of the cabildo. Because this was the case, the arrangements adopted were based not on any idealized legal prescription, but on the specific notions which members of the cabildo (or of the Canarian community at large) were able to articulate and enforce.

Only a small number of people (six to eight farmers and perhaps one governor) could have been influential in the transmission of the specific elements which were adopted. This fact ensured that Canarian practice was not introduced in its fullest form but only in a highly selective manner, bearing the personal stamp, perhaps, of as few as one or two individuals influential enough to impose their ideas on the rest. Thus the usage of dula in San Antonio in the sense of one day of water seems more properly a Tenerifian usage, whereas the secuestro and attitude towards propios seem based on Gran Canarian experience. (Nor can the influence of La Palma practice be discounted. According to an oral tradition preserved by his descendants, part of Francisco de Arocha's duties as clerk was to keep an account of the dulas. As the man who, in large part, presided over the formal arrangements of water distribution, Arocha would have been in good position to transmit the distinctive custom of La Palma.)

Considering the whole history of Canarian institutions in the San Antonio irrigation system, from 1731 to the Espada Ditch Company of this century the processes of diffusion and cultural conti-
nuity seem to have worked in the following manner:

1. Once constructed, the San Pedro Ditch, all of whose first users were Canarians, was controlled in the manner familiar to those settlers who had irrigated in the Canaries.

2. The survival of Canarian customs was ensured by the fact that the Canarians monopolized the cabildo offices (they had been appointed with life tenure) for one whole generation. Thus whenever a situation came up regarding the distribution on the ditch, whose governance was the responsibility of the cabildo, the matter was bound to be resolved by recourse not only to the civil law of waters but to Canarian customary law as well.

3. By the time the Upper Labor Ditch was built in the 1770's and, later, when the cabildo assumed control of the irrigation systems of the extinguished missions, the custom of the Canaries had been generalized in the culture of the town and was naturally extended to the newly acquired systems.

4. Beginning in the 1820's the town council began to make explicit, in its ordinances and deliberations, many procedures and precepts which may not have been previously recorded or formalized. Similarly, beginning in the Mexican period one can describe a process of codification, whereby customary irrigation law, as it had developed in the course of the eighteenth century, was written down, both in San Antonio and throughout the state of Coahuila-Texas.

5. The survival of Canarian elements in the modern Espada system highlights the persistence of cultural forms. The Ditch ceased operations about 1880 for nearly fifteen years. When operations began again, there were hardly any Spanish-speaking irrigators left in the system. Even so, few new norms were introduced, inasmuch as the customary prescriptions were commonly enough known in San Antonio as to provide a natural and ready-made model. There may be institutional continuity in spite of relatively long periods when the institutions themselves may exist only in a latent form.

These conclusions suggest the need for new approaches to the history of town life in the Spanish Southwest. The actual surviving
The documentation is not extensive or complete enough to permit the reconstruction of municipal institutions as they existed in the Spanish and Mexican periods without recourse to complementary or supplementary historiographical techniques. First and foremost, the comparative method must be applied. There are other instances of institutional procedures with a long history — such as those relating to the market master of San Antonio, for example — for which evidence is totally lacking until substantial codification was effected during the Mexican and early Anglo periods. Such codes could be advantageously searched for Spanish elements which, however, might not represent "contact culture" so much as direct implantations of regional customs. Second, the persistence of secuestro in the modern Espada system proves that there are elements of Spanish culture which persist as living practice without being codified at all, suggesting the need for the application of more properly anthropological techniques of investigation.

That some institutional elements have survived in periods of latency suggests A. L. Kroeber's notion of stimulus diffusion, whereby elements of one culture are adopted by members of another who may often be unaware of the provenance of the custom.¹¹⁸ The latency concept makes possible a methodology for analyzing more recent evidence to gain knowledge of Spanish colonial customary practices. A fault in the previous literature is that when "Spanish elements" in law have been considered there has been an assumption of the continuity and direct influence of civil law and an avoidance of customary law tradition.¹²⁰ Or, there has been an assumption that the form of Spanish customary law has been maintained but that the content has been suffused with or replaced by Anglo-American law.¹²¹ Such conclusions stand to be modified substantially in the light of comparative analysis.
REFERENCES


2 On the persistence of these institutional arrangements and legal precepts in the Mediterranean world, see Thomas F. Glick, *Irrigation and Society in Medieval Valencia* (Cambridge, Mass., 1970), pp. 187-188.


4 For example, the gruea of the Heredamiento of Telde (Gran Canaria) is composed of 173 distinct sources, all of which are listed in the ordinances of the community. See *Ordenanzas de la comunidad de la vega mayor de Telde* (Las Palmas, 1802), pp. 5-6, for a general description of the gully and pp. 29-35 for the detailed enumeration of the various fuentes, remanentes and filtraciones.


7 Francisco Morales Padrón, Sevilla, *Canarias y America* (Las Palmas, 1970), p. 175; Marcos Guimerá Perez, review of Hernández Ramos, *Heredades de Aguas*, *Revista de Historia Canaria*, 26(1960), 169; Pompeyo Crehaet, "Sugerencia y glosa a la ley sobre Comunidades de Aguas de 27 de diciembre de 1956," *Anuario de Derecho Civil* (Madrid), 10(1957), 1121 n. 1; and Francisco Jacinto de León y Matos, *Noticias en razón del establecimiento y formación de los Heredamientos que hay en esta Isla y de los Repartimientos de las tierras en que se riegan las aguas; formación de las Ordenanzas municipales en que se comprenden las de alcaldes de agua* (Las Palmas, 1783). I have consulted the *Noticias* of León y Matos in a typescript copy from the manuscript preserved in the Museo Canario, Las Palmas, Colección de Documentos de Millares Torres, vol. 6, fols. 215-355.


10 León y Matos, *Noticias*; and Manuel Hernández González, *Régimen jurídico de las aguas y auxilio para obras hidráulicas y abastecimientos* (Las Palmas, 1963), p. 8. I have consulted a mimeograph copy of Hernández González in the Instituto Canario de Estudios Económicos. On the history and geography of the sugar industry in Gran Canaria and Tenerife, see Victor Morales Lezcano, *Síntesis de la historia económica de Canarias* (Santa Cruz de Tenerife, 1966), pp. 15-19; and Guillermo Camacho y Pérez Galdós, "El cultivo de la caña de azúcar y la industria azucarera en Gran Canaria (1510-1535)," *Anuario de Estudios Atlánticos* (Madrid-Las Palmas), 7(1961), 11-60. Since mills require a continuous flow of water in order to function, they are typically the focal points of conflict with agricultural users (see
Glick, *Irrigation and Society in Medieval Valencia*, pp. 86-87). This potential for conflict was heightened in the Canarian systems owing to the overwhelming economic and political power of *ingento* owners. See for Gran Canaria, Camacho, "Cultivo de la caña," pp. 20-21, a 1517 suit of eleven irrigators of Fírgas against sugar mill owners, and Pedro Cullen del Castillo, ed., *Libro Rojo de Gran Canaria o Gran Libro de Provisiónes y Reales Cédulas* (Las Palmas, 1947), pp. 117-118, a 1533 suit of millers against upstream users — "personas ricas e favorecidas." For Tenerife, see Maria Luisa Fabrellas, "La producción de azúcar en Tenerife," *Revista de Historia Canaria*, 18(1952), 466. The weight of the medieval Spanish civil law of waters fell on the side of agricultural users; see Jesus Lalinde Abadia, "La consideración jurídica de las aguas en el derecho medieval hispánico," *Anales de la Universidad de La Laguna. Facultad de Derecho*, 6(1968-1969), 84-85.

José Peraza de Ayala, "El Heredamiento de aguas de Orotava. (Notas y documentos para un estudio histórico-jurídico de las aguas en Canarias)," *Estudios de Derecho Administrativo Especial Canario*, III: 43. Resistance to total alienability was strong until the past century. The heredamientos did not like to see their water diverted to fields not traditionally reckoned as within the service area of the gully. The anonymous author of a proposed water law complained at mid-century that an article in the Ordinances of 1529 concerning the wasting of water had been "unjustly interpreted" to the effect that no water be taken out of the service area of the heredamiento. It is a telling commentary on the blatant privatization of the past hundred years that the old heredamientos were unwilling to carry privatization to its ultimate consequence: the total separation of land from water, but only envisioned a system more flexible than one of complete adscription would have allowed. See "Proyecto de reglamento para las sociedades de aguas," *El Porvenir de Canarias* (Las Palmas), nos. 42-47(1853), 336.

11 Lalinde, "Consideración jurídica de las aguas," pp. 43-93, passim.

José Peraza de Ayala, "El Heredamiento de aguas de Orotava. (Notas y documentos para un estudio histórico-jurídico de las aguas en Canarias)," *Estudios de Derecho Administrativo Especial Canario*, III: 43. Resistance to total alienability was strong until the past century. The heredamientos did not like to see their water diverted to fields not traditionally reckoned as within the service area of the gully. The anonymous author of a proposed water law complained at mid-century that an article in the Ordinances of 1529 concerning the wasting of water had been "unjustly interpreted" to the effect that no water be taken out of the service area of the heredamiento. It is a telling commentary on the blatant privatization of the past hundred years that the old heredamientos were unwilling to carry privatization to its ultimate consequence: the total separation of land from water, but only envisioned a system more flexible than one of complete adscription would have allowed. See "Proyecto de reglamento para las sociedades de aguas," *El Porvenir de Canarias* (Las Palmas), nos. 42-47(1853), 336.

12 Glick, *Irrigation and Society in Medieval Valencia*, p. 222.


16 Ibid., pp. 14-15: "quántas días e horas de noche e de día devan aver del agua los herederos de los dichos pagos e términos."


18 Camacho, "Cultivo de la caña," p. 15. The size of the suerte varied according to the quality of the land; individual farms rarely consisted of more than two or three suertes; see Camacho, "Cultivos de cereales, viña y huerta en Gran Canaria (1510-1537)," *Anuario de Estudios Atlánticos*, 12(1966), 253. The Canarian suerte was introduced as an area measure into colonial Mexico, where by the late sixteenth century it had become standardized at 8,000 square cubits, or about five and a half acres; see Ward J. Barrett, *The Sugar Hacienda of the Marqueses del Valle* (Minneapolis, 1970), p. 114.

19 *Ordenanzas de la comandancia de regantes de Satautejo y La Higuera, en la isla de Gran Canaria* (Las Palmas, 1880), p. 9.

20 Francisco Guerra Navarro, *Contribución al léxico popular de Gran Canaria* (Madrid, 1965), pp. 232-233; Domingo Deniz, *Historia de Canarias* (Las Palmas, 1857). (Deniz has never been published; I have consulted a typescript, in four vols., in the
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Museo Canario.) Simón Benítez Padilla, Gran Canaria y sus obras hidráulicas. Bases geográficas y realizaciones técnicas (Las Palmas, 1955), pp. 192-196; Nicolás Díaz Saavedra, “La heredad de aguas de riego o régimen del inmueble móvil,” Revista del Foro Canario (Las Palmas), no. 11 (1955), 34. In irrigation communities recently formed to exploit newly-welled sources, the most common turn is also 15 days; see Marcos Guimerá Peraza, Régimen jurídico de las aguas en Canarias (La Laguna de Tenerife, 1960), p. 24. For descriptions of individual dulas, see Ordenanzas de... Satautejo, p. 19; Ordenanzas de la comunidad de propietarios y regantes del valle de Tenoya (Las Palmas, 1890), p. 12; and Ordenanzas de... Telde, p. 6.

21 Deniz, Historia; and Benítez, Gran Canaria y sus obras hidráulicas, p. 198.
22 Guimerá, Régimen jurídico, pp. 72-73. The Ordenanzas de... Telde (p. 6) give the standard measure as, however, the cuarta, which is one-fourth of an azada. Here, the cuarta is defined as “the portion of the gruesa which issues through one of the cited turn-outs during twelve hours of the clock and only once each 28 days, this being therefore the so-called dula period, or turn” (my translation). Each azada, in turn, corresponds to one “mouth” of a cantonera, which effects the aliquot division. On the azada, see also Guerra Navarro, Léxico popular, pp. 67 and 178; Hernández Ramos, “Las cantoneras de Gran Canaria, parten las aguas, pero no las miden,” Boletín de Información Económica (Las Palmas), 3a época, no. 8 (May, 1959), 9; and Francisco María León y Falcón, “Memoria sobre el estado de la agricultura en la provincia de Canarias,” Boletín Oficial del Ministerio de Comercio (Madrid), no. 40 (30 September 1852), 683.

23 The water of the heredamiento of Satautejo (Ordenanzas, pp. 4-5) is divided into two and one-quarter azadas, each azada being divided into eight equal portions, called surcos. Thus the whole gruesa consists of 18 surcos, each equivalent to “twelve hours of the clock.” (The designation “of the clock” is included to distinguish this hora from other horas of measure, originally real hours, but whose value was changed over the years by a process of halving or doubling the time value of the azada.) The gruesa of Tenoya is divided into “days” (azadas) of 24 hours, subdivided into four cuartas, and each of these into two half-cuartas (surcos) (Ordenanzas de... Tenoya, p. 12). The Canarian usage sulco (for surco) was introduced into South Texas; see Neal King, “Some Irrigation Law Problems Peculiar to the Lower Rio Grande,” School of Law, University of Texas, Proceedings, Water Law Conferences, November 20-21, 1954, (Austin, 1954), p. 304.

25 Ibid., pp. 674, 676. On cantoneras generally, see Guerra Navarro, Léxico popular, pp. 133-135; Hernández Ramos, “Las cantoneras de Gran Canaria” and “Algo más sobre cantoneras,” Boletín de Información Económica (Las Palmas), 3a época, no. 9 (June 1959), 5-6; and León y Falcón, “Memoria,” pp. 674-677. On the cantonera of Arucas, see José Joaquín Mazora Vázquez, “Heredades canarias de aguas,” Banco de Vizcaya. Revista Financiera, 19, no. 76 (1953), 45. Arucas has the most complicated system of water distribution of all Canarian heredamientos. Apparently, there was more than one cantonera in the past, because León y Falcón (“Memoria,” p. 674) describes the Arucas cantonera located near the main spring as having but eight bocas, of equal size, and a ninth half the width of the others. Thus, this cantonera divided eight and one-half azadas of water, which joined with water from other cantoneras in the system, yielding a total gruesa of twelve azadas. See the photo of the old cantonera in Hernández Ramos, Heredades de aguas, p. 73. The
situation in 1590 (24 bocas and azadas) represents a "doubling" of the water, an expedient which probably reflects increasing parcellation over the period of a century (see Glick, *Irrigation and Society in Medieval Valencia*, p. 214). The situation changed again in the early 1960's when the "open" cantonera of Arucas was replaced by a modern, pressurized one which guaranteed absolute equality in division. This wonder of modern technology was greeted with proper reverence (and an unusual lack of hostility) by the irrigators; see Hernández Ramos, "Arucas. La Heredad y el ornato público. 'Cantonera' que pudo originar un litigio," *Diario de Las Palmas*, 13 and 14 February, 1963.

26 Hernández Ramos, *Heredades de aguas*. p. 71. Guimerá (*Régimen jurídico*, p. 81) dates the practice from the eighteenth century. Mazorra Vázquez ("Heredades canarias de aguas," p. 45) asserts that the secuestro was established by the Real Audiencia, in the face of consistent defaulting by irrigators; he gives no source for this assertion.


29 On the manner in which secuestro waters are auctioned and the funds received, see Ordenanzas de . . . Tenoya, p. 12. On the regulation of secuestro water by the repartidor (official in charge of distributing the water) of the heredamiento of Arucas, see Juan Gavala and Enrique Goded, "Informe relativo a los aprovechamientos de aguas en las Islas Canarias," *Boletín del Instituto Geológico y Minero de España*, 51 (1930), 6. On the difficulty of getting irrigators to pay for anything not covered by secuestro funds, see Hernández Ramos, "Algo más sobre cantoneras," p. 6. Recent litigation concerning secuestro is summarized by Carlos Ramírez Suárez, *Estudio histórico, legal y jurisprudencial de las aguas de regadío en Canarias* (Las Palmas, 1962), pp. 171-173.


32 The estate was progressively subdivided until the present, when there are 1,500 member irrigators. On the dula of Argual and Tazacorte, see *Estatutos del Heredamiento de las Haciendas de Argual y Tazacorte* (Barcelona, 1967), pp. ix-x, 7-8; La Rosa, "Antecedentes históricos," p. 27; and Guimerá, *Régimen jurídico*, p. 76n. The dula of Los Llanos, another La Palma system described in the last century, lasted ten days and was divided into ten periods of twenty-four hours each, also called décimos (León y Falcón, "Memoria," p. 668).

33 *Estatutos . . . de Argual y Tazacorte*, pp. 10-11.

34 *Proyecto de Ley concediendo la personalidad jurídica a las Heredades de Aguas de Canarias tal como la costumbre inveterada y los antiguos textos legales se reconocen* (Las Palmas, 1953), p. 2; Ordenanzas de . . . Telde, p. 3; León y Matos, *Noticias*. [The Old World Background of the]
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38 Guimerá, Régimen jurídico, pp. 117-121.
36 Ordenanzas de ... Tenoya, p. 13.
37 Ordenanzas de ... Telde, p. 4; Hernández González, Régimen jurídico, pp. 11-12.
38 Camacho, “Cultivos de cereales,” p. 259.
39 Peraza de Ayala, “Heredamiento de aguas de Orotava,” p. 78 n. 2; Ordenanzas de ... Telde, p. 4. In order to conform with the Royal Order of June 25, 1879, putting into effect article 328 of the Spanish Water Law of June 13, 1879, quite a few heredamientos transformed themselves into communities (i.e., with putatively public, rather than private, water rights) in order to have their customary arrangements gain status in law. The results were a series of hybrid ordinances, some of which have been cited in this essay. The operating procedure which these rules describe is traditional and hence the ordinances drawn up between 1880 and 1900 are fertile sources of historical information. The administrative structure of the community-heredamiento does not, however, reflect traditional practice; see Guimerá, “Algunas precisiones,” pp. 76 and 86; and Régimen jurídico, pp. 29-31.
40 The texts of the ordinances of 1507 and 1527 are reprinted in Peraza de Ayala, “Heredamiento de aguas de Orotava,” pp. 80-87. Some irrigation regulations were included in the Municipal Ordinances of Tenerife compiled in 1540 and later included in the recopilación of 1670; these are to be found in Peraza de Ayala, Las antiguas ordenanzas de la isla de Tenerife (La Laguna de Tenerife, 1935), pp. 53-59.
41 Peraza de Ayala, “Heredamiento de aguas de Orotava,” p. 88.
43 Peraza de Ayala, “Heredamiento de aguas de Orotava,” pp. 59-61, 72-76, and 76 n. 2.
44 I have examined a partial typescript of the Partición Grande. A more complete set of rules, which I have been unable to consult, was drawn up on April 14, 1698.
45 Lalinde, “Consideración jurídica de las aguas,” p. 72.
46 The text of the “Merced del agua de Texeda,” dated July 26, 1501, is reproduced in Cullen, Libro Rojo de Gran Canaria, pp. 22-23.
47 Sosa, Topografía, pp. 23-24 (translation mine).
48 León y Matos, Noticia; Gregorio Chil y Naranjo, Estudios históricos, climatológicos y patológicos de las Islas Canarias, 3 vols. (Las Palmas, 1876-1891), III:571-579; La Rosa, “Antecedentes históricos,” p. 31.
49 León y Falché, “Memoria,” p. 688. Private water (apart from secuestro, sobrantes, etc.) was also sold in Tenerife, only apparently not by the municipal corporation. See Camacho, La Hacienda de los Principes (La Laguna de Tenerife, 1943), pp. 31-32, for the sale at public auction of 127 days of winter water and 60 of summer by a private proprietor.
50 See Silvio Zavala, Estudios indígenas (Mexico, 1948), p. 84.
51 On discretionary authority of officials in Valencia medieval communities, see Glick, Irrigation and Society in Medieval Valencia, pp. 71 and 73. The heredamien­tos of Tenerife were institutionally weaker than those of Gran Canaria which Marcos Guimerá Peraza characterizes as having been “truly feudal” (interview, July 24, 1971).
See especially Morales Padrón, Sevilla, Canarias y America, 11, 27-28, 34, 55.

59 Ibid., pp. 44, 214, 226; Camacho, "Cultivo de la caña," pp. 25-26; Barrett, "Sugar Hacienda," p. 105. On the maestros de hacer ingenios, see also Fabrellas, "Producción de azúcar," p. 470. Many of the early sugar technicians on Tenerife were Portuguese. the sugar industry of Madeira somewhat antedating that of the Canaries.


62 Mattie Alice Austin, "The Municipal Government of San Fernando de Bexar, 1730-1800," Quarterly of the Texas State Historical Association, 8 (1904), 221-228.

63 In addition, Martin and Ignacio Lorenzo de Armas were Canarians, but their exact origin is not recorded. Frederick C. Chabot states that Salvador Rodríguez was born in Tenerife in 1688, but that his son Patricio was born in Lanzarote, ca. 1715; With the Makers of San Antonio (San Antonio, 1937), p. 165.


65 Ibid., pp. 6 and 13; also, Agustín de la Hoz, Lanzarote (Madrid, 1862), p. 19.

66 A gauge placed in the river below San Antonio Springs in 1907 measured a flow of 27 million gallons daily. However, the eighteenth-century flow would have been more since the ground water had since been diminished by the drilling of wells; see Louise Lomax, San Antonio’s River (San Antonio, 1948), p. 16. For detailed information on the watershed of the river, see Isaac M. Cline, Precipitation and the Flow of Rivers in Texas, Considered in Relation to the Question of Irrigation (Galveston, 1893).


68 See Glick, Irrigation and Society in Medieval Valencia, pp. 133-134.
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con señalamiento de días a cada interesado..." (Bexar Archives, The University of Texas. Casafuerte to Vergara, December 25, 1731). The papers of the Bexar Archives (hereafter abbreviated B.A.) are arranged by date; therefore no further indication of location is necessary. The University of Texas Archives also has an ample collection of transcriptions and translations of documents relating to the Spanish and Mexican periods. Vol. 69 of the Blake Research Collection (not 62, as in Betty Eakle Dobkins, The Spanish Element in Texas Water Law, Austin, 1959, p. 173) contains a variety of documents relating to water use and is therefore useful as a starting point. Blake’s translations are filled with inexact renderings and he has often embellished incorrectly on transcriptions from English originals, especially where technical details are involved.

67 B.A. Translations, 17:1-26. The differences were settled on August 25, 1745 (pp. 27-32).

68 “... por lo tocante al repartimiento de aguas, de que en caso de que en algún tiempo sean insuficientes para gozarlas continuas, las gozan por tandas...”; “Original Documents Relative to the Canary Island Families which Settled in San Antonio” (transcript and translation of original documents in the possession of Mr. Louis Lenz; typescript in the University of Texas Archives. I have used this translation, checking against the Spanish transliteration).

69 Recopilación de leyes de los reynos de las Indias, 4 vols. (Madrid, 1774), II: fol. 113. Disposition of Charles V. Valladolid, November 20, 1536: “Ordenamos, que la misma orden que los indios tuvieron en la division y repartimento de aguas, se guarde y practique entre los Españoles en quien estuvieren repartidas y señaladas las tierras y para esto intervengan los mismos naturales, que antes lo tenían a su cargo, con cuyo parecer sean regadas, a fe de a cada uno el agua, que debe tener, sucesivamente de uno en otro, pena de que al que quisiere preferir, y la tomare, y ocupare por su propia autoridad, le sea quitada, hasta que todos los inferiores a él rieguen las tierras, que tuvieren señaladas.” Casafuerte cited this chapter verbatim in an order dated December 10, 1731.

70 Decree of April 14 and May 2, 1735, in B.A. Translations, 6: 84 and 9a. Dobkins, Spanish Element in Texas Water Law, p. 119 n. 86, cites this document as referring to the San Pedro Canal, but on p. 111 says that construction was begun in 1738! Samuel M. Buck, Yanaguana’s Successors: The Story of the Canary Islanders’ Immigration into Texas in the Eighteenth Century (San Antonio, 1949), p. 179, says work was begun in 1739 and completed the following year. Lomax (San Antonio’s River, p. 37) and Holmes (“Acequias of San Antonio,” p. 38) say work was begun in 1738. By 1741, land conveyances record parcels abutting on the Acequia Madre (Chabot, Makers of San Antonio, p. 163).


72 In the conveyance of a parcel granted to Nicolas Benavidez in 1737, it is noted that “for the time being, he would not be allowed any irrigation water for said solar until it could be drawn from the San Antonio River” (Valmont Plantations, p. 71 n. 21). This is no evidence that the San Pedro Ditch was not in operation, however, because that ditch drew all of its water from the creek, not the river.


74 Buck, Yanaguana’s Successors, p. 26.

Buck, Yauaguana's Successors, pp. 120-124 and 177.
77 Judge Rodriguez, a descendant of Antonio (Chabot, Makers of San Antonio, p. 171) says in his Memoirs that his cousin Mariano was "the son of Francisco Rodriguez who laid out most of the irrigation ditches;" José María Rodriguez, Rodriguez Memoirs of Early Texas (San Antonio, 1913), p. 52. Surely the Judge had his traditions confused on this issue, because Francisco was born in San Antonio in 1742, too late to have participated in any project except the Upper Labor. Francisco was not from a Canarian family (Chabot, p. 74).
78 Letter from Mariano Francisco de los Dolores to R. F. Ministros de las Misiones del Rio de San Xavier, October 12, 1750; The University of Texas Archives, Spanish Material from Various Sources, Transcripts from Santa Cruz de Querétaro, 1750-1787 (Dunn Transcripts); "No le infiere a ninguna atraza, o menoscabo esta resolución cuando tenemos a la vista en la Villa de San Fernando que el corto Arroíuelo de San Pedro de donde sacan las familias Yañez una Azequia con menos caudal; es bastante para 15 parciernos sin otros 5 días que están asignados a los propios de Villa."
79 City Council of San Antonio, Minutes, Journal A, University of Texas Archives, Blake Collection, 69: 372-377: "Se ha ordenado y decretado que en su debido tiempo, la azuca de la Azequia de esta Ciudad será dividida o puesta en dula dentro de los labores de abajo y los solares de esta ciudad y que parte interesada será notificada de dicha división y los días o horas que cada uno tiene derecho a tomar la agua."
80 City Council of San Antonio, Minutes, Journal A. The Spanish version differs somewhat from the English: "... informe ... haver puesto la agua de la acequia que pasa por la Ciudad en dula desde el domingo día 22 del presente con el reserve del quinto que pertenece a la Ciudad el cual comienza el Jueves día veinte y seis del mismo un poco antes de meterse el sol."
81 City Council of San Antonio, Minutes, Journal A, Blake Collection, 69: 381-382, corrected against typescript of Journal A also in University of Texas Archives.
85 Transcript of bill of sale of land and irrigation water by María Nestora del Pozo y Guajardo to Juan José Farias, August 8, 1820, in Valmont Plantations file, Supreme Court of the State of Texas, Austin: "... una heredad compuesta de cuatro horas y quarenta minutos de agua con sus tierras correspondientes del labor."
86 Transcript of grant of land by Juan Manuel Zambrano to María Guadalupe de la Garza, in Valmont Plantations file: "Los días de agua son, el primero de dulas, el nuebe, y el beinte y uno, según el uso se ha observado en dicha labor. Cada día de agua encierra veinte y cuatro horas y de este modo es como doy los tres." An English translation is included in Valmont Plantations, p. 91.
87 City Council of San Antonio, Minute Book 2; Blake Collection, 69: 383.
88 "Account Drawn by the Citizen Manuel de la Garza, Commissioner for the Illustrious Ayuntamiento of this City, for the Collection of the Rent of the Water from the Extinguished Missions of La Concepción, San José, San Juan and Espada," Uni-
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versity of Texas Archives, Blake Collection, 69: 349-352.
89 The Minute Book of the Espada Ditch Company is in the possession of the Secretary of the Company, Mr. L. McRae. A microfilm copy may be consulted at the Texas History Center, University of Texas at Austin.
90 Thomas U. Taylor, Irrigation Systems of Texas (Washington, D.C., 1902), p. 53. Originally it seems that the Espada turn was a thirty-day cycle. In 1898, however, the rights were halved in order to speed up the turn, a common practice in eastern Spain: "It was decided to cut down each accordance of water one-half so that each owner showed out his share every fifteen days" (Espada Ditch Company, Minute Book, January 26, 1898).
93 Corner, San Antonio de Bexar, pp. 48-49.
95 Ordnanzas (sic) municipales para el gobierno y manejo interior del ayuntamiento de la ciudad de San Antonio de Bexar (Leona Vicario, 1829), pp. 15 and 33; "Ordinance for the Better Regulation of the Water," City Council of San Antonio, Minutes, Journal A, January 17, 1840 (University of Texas Archives, typescript; also Blake Collection, 69: 373-377.
96 Josè Flores et alii to Governor Antonio Martinez, February 18, 1822; B.A.; Blake Collection, 69:326-327.
97 See, for example, dispositions of the Council re cleaning the Main Ditch, February 24, 1831; December 21, 1837; and March 14, 1838 (Blake Collection, 69: 366 and 371).
100 B.A.; Blake Collection, 69:334, January 20, 1826: "The Alcaldes of the extinguished missions of San José, San Juan and San Francisco de Espada . . . have petitioned to this Ayuntamiento the necessity in which, for the present, they find themselves for being assisted with an escort, while they conclude the cleaning of their acequias, for which they have to leave the families entirely alone, and without which it may be able to favor them in a case of the Indians committing barbarities on a day of those of which they perform their labor." (Blake's translation is as picturesque as the original!)
103 Ordnanzas municipales . . . de San Antonio, p. 28 (article 44): "Para la formación de estos [municipal funds] adopte este ayuntamiento el recurso de los que vajo la denominación de propios y arbitrios se han colectado en esta ciudad" (emphasis in original).
The Old World Background of the

Ibid., p. 31: “se cobrará un peso anual de pensión a los dueños propietarios de cada uno de los días de agua en que están repartidas las diversas sacas que componen esta municipalidad.”

City Council of San Antonio, Minutes, Journal A, University of Texas Archives, typescript, December 28, 1841. This entry is extremely interesting because it records the near unanimous unwillingness of any of the irrigators to pay this tax: “Los comisionados para el cobro de senso de dulas y propios de esta ciudad hisieron presente que la mayor parte de los obligados al pago de dicho senso, se resisten hacerlo por los seis años que se les cobró, por lo que el cuerpo resolvió que se les excijiese por lo que corresponda a los años de 1840 y 41.” The lands of the missions were distributed among new settlers, Spanish and Mexican. If these people had previously been unacquainted with a patrimonialized water system, they would naturally resist paying a tax on water which was in effect a rental fee, or straight real estate tax, and in no way a maintenance charge. The land was granted to them with water adscribed (that is, as public water, granted with usufructory rights). Why then pay anything?

Tax lists (1824) for land grantees of the properties of the missions, with enumeration of the dulas granted to each, can be found in Valmont Plantations, pp. 102-117. See also the letter of J. A. Saucedo to Governor Rafael Gonzales, September 18, 1825, B.A.: Blake Collection, 69:332-333 (a request for remission of water taxes); and City Council of San Antonio, Minutes, Journal A, October 28, 1841: “Be it further ordered and decreed, that the Mayor will also exact the payment of two reals per annum for each & every dula (or day of water) of those comprehended in the different irrigation ditch inlets of the San Antonio River by virtue of an act passed by the legislature of Coahuila and Texas, No. 158, dated 1 May 1832” (Blake Collection, 69: 370-379, checked against typescript; original in English).

“Actas del Segundo Congreso Constitucional del Estado Libre de Coahuila y Tejas,” University of Texas Archives, typescript, May 13, 1829. In view of the fact that the grain harvests were free from tax, a deputy from San Antonio asks that one peso per day of water be charged for the benefit of the municipal treasury and a stipulation to that effect be included in the ordinances of the town (n. 104, above).

Orndanzas municipales ... de San Antonio, p. 21: “... en la distribución de las mercedes de agua y curso de esa por los puntos más cómodos a los interesados, cuidando a la vez de la limpieza de su respectiva asequia, y cortadores lo mismo que se ha prescrito, para la que atravieza esta ciudad.”

City of San Antonio, Charter and Ordinances (San Antonio, 1877), pp. 56-57.

Valmont Plantations, p. 92.

Ibid.

Copy of a petition filed with the State to increase Díaz’s water rights, included in Espada Ditch Company Minute Book, March 7, 1897.

Espada Ditch Company Minute Book, March 1, 1908. At the meeting of February 7, 1909, it was moved “that the twelve hours of the Griff Jones water and the 31st water (i.e., secuestro water) be sold to the highest bidder.”

Meeting of April 4, 1895: “Mr. Walton made application to increase his irrigated acreage from 125 to 200 acres, the extra 75 acres corresponding to that belonging to Luis Unger.”

City Council of San Antonio, Minutes, Journal A, January 17, 1840 (Blake Collection, 69:372); April 5, 1847 (Blake Collection, 69: 381); May 17, 1847 (Blake Collection, 69:383).

Espada Minute Book, February 25, 1912.
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118 Recounted by Maria del Refugio Arocha (b. 1861), a fifth generation direct descendant of Francisco; interview with her daughter, Rosaura Aldana, San Antonio, May 19, 1972.

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