

Water in History: Global Perspectives

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ABSTRACTS

Christoph Bernhardt (Institut für Regionalentwicklung und Strukturplanung, Erkner, Berlin):

Debates on ecological problems of river construction in a historical perspective: The case of the correction of the upper Rhine (1817 - 1876)

The correction of the upper Rhine between 1817 and 1876 was the largest and most difficult water engineering project in German history before the 20th century. Organised in international co-operation between the states of Baden, France and Bavaria it affected about one million inhabitants along the riverside. Finally, the course of the Rhine was straightened up between Basel and Worms and shortened by 50 km or 37%. Since the beginning of the planning a wide range of debates and interventions by different social groups and institutions brought many arguments in favour and against the impact of the project on the landscape and environment. On one hand these debates reveal the consciousness in different spheres of a pre-industrial society about environmental problems and the dangers of large-scale hydraulic engineering. Secondly the discussions during the realisation of the project show the shift in the opinions of a majority not only of the rural and urban population, but also amongst critical engineers and politicians. The acceptance of large-scale engineering grew rapidly; the population tried more and more to take a part of its profits, e.g. by demanding the reclaimed land. These new attitudes can be read as elements of a modern, industrial consciousness.

The paper will discuss the major aspects of three debates. Firstly, the protests of the rural and the urban population against the planned river construction, which were based on centuries - old experiences with the river and with earlier attempts to master its dangers; and the changes of attitudes toward the river, the engineers and the state during the realisation of the correction. Second, the interventions of the Prussian state, which concentrated on the increasing danger of floods downriver as a consequence of the correction, but after some time were no more mentioned because of the advantages of the project for shipping. And finally, the problems and progress in the co-operation between Baden and France, showing the difficulties that the meandering river, which continuously changed its course, put to a cartographic and juridical definition of property and state boundaries as a precondition of large-scale international hydraulic engineering projects.

Richard Coopey, Aled Jones (University of Wales, Aberystwyth):The Boundaries of Water History: The Case of Britain

The history of water - its control and supply - touches upon many important historical issues and processes. This paper will survey the breadth of studies relating to the history of water in Britain, across a range of disciplines. These include the changing understandings of water purity and supply through the rise of industrialisation and urbanisation, the political economy of water supply, the history of water-related engineering and technologies, and the importance of water resources in local and national ideological and political contexts. The survey will also highlight the work and ambitions of the Aberystwyth water history project.

Aled Jones is Head of the Department of History and Welsh History at the University of Wales, Aberystwyth, and holds the Sir John Williams Chair in Welsh History. He is the co-director of the Water History Project at Aberystwyth, an interdisciplinary study of the history of water resources in Wales and England.

Dr. Richard Coopey is currently lecturer in economic history at the University of Wales, Aberystwyth, and Senior Research Fellow at the London School of Economics. Richard is co-director of the Aberystwyth Water History Project, and specializes in the technological and political-economic history of water supply schemes. He is also currently working on an ESRC-funded project entitled 'Information Technology Policy in Britain, 1945 - 1990', and is also co-director of a Leverhulme-funded project on 'The History of British Mail-Order Retailing'.

Richard Coopey (University of Wales, Aberystwyth):Engineering Purity: Constructing the Birmingham Welsh Water System 1870-1950

This paper will outline the network of factors involved in the shaping of the Elan-Claerwen scheme to provide water for Birmingham. The system was first conceived in the mid-nineteenth century, begun in the 1890s and completed in the 1950s. Throughout this period the formation and implementation of the scheme, its design and ambitions, were formed and reformed by a series of social, political, scientific and technological processes and understandings. The paper will chart these processes examining, for example, the triumph of an expansionist municipal political economy, the relationship between engineers and politicians, national and local political and proprietorial rivalries, and contemporary debates over the meaning, and scale of necessity of pure water. The paper will demonstrate that the Elan scheme is, rather than the embodiment of technological progress and efficiency, the embodiment of a particular range of social and political processes.

John T. Cumbler (University of Louisville, Kentucky):Riparian Rights: Water - How Much, Where Is It, and What's It Like

Water's crucial role in maintaining life guaranteed it a central role in legal history. When English property rights began to be defined, first through common law, then through statutory law, water, second to land, played a prominent part. Over the several hundred years of litigation and court case precedents, a body of law emerged which provided the foundation upon which judges issued decisions. And as first the American colonies, then the new nation, established its legal system, it

merged into this long tradition of English common law. In the case of water for hundreds of years cases and the law rested upon the issue of quantity. It dealt with who had rights over water, particularly running water, how much water did they control, how much could they use and where could they use it. This concern over quantity carried over from England to America and merged into the evolving American legal tradition.

In the middle of the nineteenth century Americans began to be concerned not only about the quantity of running water but also about quality. As America urbanised and industrialised, running water was increasingly compromised by its use. Polluted water raised the question of what rights down stream users had to quality or what right upstream users had to sump wastes into running streams. The answers to such questions were central to social and economic development. The courts in America, where these questions were most often posed, had to fashion answers to these questions in the context of rapid change and development and with little traditional precedents.

This paper looks at the evolution of riparian rights in nineteenth century New England as society became increasingly urban and industrial. It, particularly, focuses on how the courts came to understand and balance riparian rights, economic development and the issue of water quality. It argues that within a framework structured around tradition and precedents, the New England courts continually shifted meaning and emphasis to provide a legal context for economic growth and expansion, while at the same time utilising the discourse of precedents, custom and history.

John Cumbler has been Professor of environmental and economic history at the University of Louisville in Kentucky since 1985, and he is also an Honorary Fellow of the University of Warwick, England. He is the author of *A Social History of Economic Decline: Business, Politics, and Work in Trenton* (New Brunswick, Rutgers University Press, 1989) and many articles.

Georgina H. Endfield (Nottingham University):

Socio-economic impacts of historical ENSO and rare climatic events in Mexico

In recent years, changes in the frequency of ENSO (El Niño-Southern Oscillation) events have fuelled attempts to reconstruct the history of ENSO and extreme climatic events prior to the instrumental period. This has been achieved using a variety of information sources including historical records (Quinn *et al.*, 1987; Quinn and Neal, 1992), high resolution proxy records including tree ring, ice-core and varied sediments, as well as lower resolution proxy records such as geomorphological and palaeoecological evidence. These studies have provided a valuable information on ENSO events and their associated climatic anomalies. Less attention has been paid to the social and economic repercussions these events have engendered, despite the relevance the associated climatically induced changes in water supply may have for contemporary rural populations living in the more climatically marginal and agriculturally fragile regions of the world.

Given that in many of these regions, lifestyles have remained largely agrarian to the present day, one way to estimate the potential socio-economic impacts for these societies would be to investigate how they have been affected by and responded to historical ENSO events. A step

towards achieving this aim would be to establish a series of regional histories in those areas believed to be the most susceptible to this phenomenon. It is the overall aim of this paper to assess the social and economic impacts of specific historical ENSO events in one such vulnerable region, namely central Mexico. The paper will employ evidence drawn from a range of archival sources, now housed in the national and regional archives of the country, to address how different sectors of society have been affected by and have responded to drought events associated with historical ENSO periods.

Georgina Endfield lectures in Geography at the University of Nottingham. Her research addresses historical and contemporary human-environmental interactions in Mexico and Latin America. She has recently published in several journals, including *Environment and History*, *Colonial Latin American Review*, *Land Degradation and Development*, and *Annals of the Association of American Geographers*.

Eran Feitelson (Hebrew University of Jerusalem):

The Ups and Downs of Arab-Israeli Water Conflicts

In the paper the argument will be made that in contrast to what could be expected from the neo-malthusian perspective the likelihood of confrontation on water is decreasing. To this end past conflicts will be analysed as a function of the changes in the Israeli political economy of water. Such an analysis will identify four distinct periods - appropriation settlement and nation-building (up to 1960), fully utilised water resources with strong inter-dependencies (1960-7) - which is the period when conflicts erupted, Israeli dominance after 1967, and again growing inter-dependence as a result of the peace process since 1993.

However I intend to show that while in the early and mid-sixties Israel was still largely dependent on irrigated agriculture, that is not the case any longer. Thus, we are not returning to the potential conflict situation of the mid-sixties. Moreover, with the rise of environmental awareness and water quality concerns co-operation becomes increasingly important. I will try to show some evidence of this change of focus.

Ludy Giebels (Hoogheemraadschap van Rijnland):

From refreshing to purifying the water. The battle against water pollution of a Dutch water board (hoogheemraadschap van Rijnland) 1900-1970

Dutch water boards are governmental institutions with autonomy and the right to pass by-laws. Most of them have roots in the middle ages, the hoogheemraadschap van Rijnland traces its own roots to the end of the 12th century. Its region comprises the triangle Amsterdam, The Hague, and Gouda, approximately 100,000 hectare and - at this moment - more than a million inhabitants.

For a long time past the most important of its tasks was regulating the quantity of the water in its region and the maintaining of dykes and dunes as a defence against the water from the outside. For the region lies not only below sea level but its water level is also lower than that of the neighbouring areas. From the beginning unofficially the care of the quality of the water was part

of its task too. Already in the 16th century there were by-laws against polluting the water by throwing into it cadavres, the wastes of industrial products etc. These by-laws however could not be applied to the towns, which were outside the jurisdiction of a water board.

In the last quarter of the 19th century there started a gradual change in the traditional care of the water quality because of the rapid increase of industrialisation and population. Towns like Leiden en Haarlem asked the *hoogheemraadschap* to refresh their canals by pumping through fresh water from the neighbouring rivers. Rijnland complied upon an agreed payment. This refreshment was a much used remedy against pollution in the parts of the Netherlands which abounded in water. Indeed the dumping of refuse at the neighbours became the overall practice until the sixties of the 20th century.

In the twenties occurred several years of unusual dry summers. One of the Rijnland regions, the horticultural area around Aalsmeer (near Amsterdam) suffered unexpectedly because the water that was used for watering the crops proved to be too salty and that resulted in a great economical loss. The general (elected) board of Rijnland decided to include officially the quality of the water, i.e. the purity in a wider sense, in its task. As in an afterthought the board decided not only on the current issue, the salinity, but also on the pollution in general (i.e. from manure; industrial pollution was not yet mentioned).

The results of this momentous decision were for the moment only more pumping for refreshing, this time on Rijnland's budget. The problem was that at that time for the most part the tax payers of the water boards were farmers. Legally it was not possible to tax the polluters, the inhabitants of the towns who produced the bulk of industrial wastes and faeces. It is clear that at that point the board would like to be more active, but it was paralysed by an *incomptabilité d'humeur* with her chief executive the head engineer, who was a difficult man to handle and only could be forced to leave in 1935. Another problem was that research on water pollution in the Netherlands was backward. The severe problems of the water pollution were known since the end of the 19th century, when a governmental commission did an overall research in the region of Rotterdam and analysed the problems in an alarming report. From around 1900 a law was in the making to prohibit bringing polluted water on public waters. After decennia of debates this law was issued in 1969.

In the meantime however water boards could use their own juridical instruments which often stemmed from bygone centuries, e.g. municipalities needed permission to drain on Rijnland 'boezem' (a system of reservoirs for superfluous polderwater) and in 1937 Rijnland levied an imposition for this permission, depending on the amount of pollution of that water. Although this tax legally was doubtful, it was never challenged.

In 1935 Rijnland got a new chief engineer, who was educated in traditional civil engineering, but greatly stimulated research in the comparatively new field of water quality. He installed a laboratorium in the old *gemeenlandshuis*, which was bought as the seat of the *hoogheemraadschap* in 1574, introduced chemical research and generally tried to convince the municipalities of the inevitability of building installations of purification. The economic crisis and the following world war did not present favourable conditions for these investments. But

engineer De Gruyter, who could wax poetical about the blessings of clean water for fishers, swimmers and all sundry people, used this period of passivity for more research.

In 1965 Rijnland took up in its official regulations the purification of the water, i.e. it abandoned the idea that the building of these installations should be the task of the municipalities, and decided to establish them. In 1969 the Law on Water pollution was passed, which left to the provinces how they wanted to execute it in its territory. Rijnland at that time was more than ready. While in many regions water boards let slip this new task from their fingers, Rijnland established itself more firmly by adopting it wholeheartedly as an already standing tradition. At this time the budget for purification of the water is 80% of the total expenses.

From 1985 **Dr. Giebels** has been the keeper of the records at the Hoogheemraadschap van Rijnland water board. She has published research about the history of waterboards and Rijnland, focussing especially on the nineteenth century.

Ludy Giebels:

The gemeenlandshuis of Rijnland

The Dutch word ‘gemeenland’ means in English ‘common land’. It stands in general for the common interests the farmers have in a region that is well defined by a common water management system.

The *hoogheemraadschap van Rijnland* is the oldest water board still existing in the Netherlands and probably the second oldest of all their water boards in the past. Governing institutions of course was in the middle ages a more or less informal activity. One did not need an office, because the secretary of the board did his work at home, sometimes helped by one or more clerks.

In 1574 the board of Rijnland bought an already existing house in the main street of Leiden, the heart of its region and a rising textile manufacturing town. The house, three times as big as the average middle-aged house, was meant as the dwelling for the dijkgraaf (dike-reeve; the head of the board) and as stopping place for the six hoogheemraden (the board). The dike-reeve and his wife mostly came from the nobility and they furnished the house according to their rank.

In the first twenty years the board doubted if the purchase was a good bargain and considered to sell it. Possibly the uncertain political situation in the first stage of the war against the Spanish (1568-1648) was part of this hesitation, but also the house was not in a good state. In 1598 a decision was made to rebuild the front. That was a difficult thing because the municipality of Leiden planned to build a prestigious town hall for itself on the opposite side of the street and did not want any competition in that field. Eventually a real treaty was concluded between the warring parties and Rijnland got consent to build the present Renaissance façade. The exterior of the house did not change fundamentally after that, only the windows were replaced in the 18th century by Empire windows. The original ones however were restored in a big contemporary restoration (c. 1970).

The interior of the house underwent many changes, the most important in the middle of the 17th century. Holland was at that time at the height of his Golden Age prosperity and the word was: impress. And impress the house still does, although in a very modest Dutch way. In the middle of the 17th century Rijnland hired the famous Dutch architect and designer Pieter Post (Mauritshuis The Hague, town hall Maatstricht, another now nearly demolished gemeenlandshuis of Rijnland in Halfweg, half way between Amsterdam and Haarlem). Pieter Post redecorated the most impressive hall of the gemeenlandshuis in Leiden, the courtroom. Dijkgraaf and hoogheemraad had juridical power in matters pertaining to water management within their region. They had high jurisdiction, i.e. the power to pass a death sentence. Also to brand: the marking-iron which was ordered for the only instance we know. For a big part the courtroom was carried out according this function: the ceiling represents a pavilion and open air, with birds and flowers possibly a reference to old Germanic law that justice had to be administered in public, i.e. the open air; a chimney-painting represents Time with all his paraphernalia who offers to Justitia the book of civil law, an allusion to the value of written law against the more doubtful customary law, which was applied by water boards. The painting is from Jan Lievens Sr., teacher of Rembrandt. The whole room is draped with gold leather ornamented with Rijnlands coat of arms, the Dutch lion and the German emperors crown, an allusion to the oldest charter which was given to dijkgraaf and hoogheemraad in 1255 by Roman King and count of Holland, William II. This event was depicted in 1655 on a painting by Cesar van Everdingen, one of the famous Dutch painters of his time (an exhibition of his work will be held this year in the museum Boymans in Rotterdam, later in Frankfurt). Another painting in this room is a portrait of King-Stadholder William. The portrait in itself is not very interesting, because there are some more of this kind. But the frame, especially ordered by Rijnland is: it represents the coat of arms of the English Kings, the Order of the Garter, apples of Orange. Interesting is the symbolism of the strategic talents of William: military power is symbolised by Hercules, strategic cunning by a woman wielding a bludgeon.

There is a red room with a Rembrandtesk chimney-painting mathematician (Jan Lievens Jr); a blue room with a painting of the gemeenlandshuis in Halfweg (Dirk Maas); an especially built archive room with a heavy iron door, the Iron Comptoir.

Andre Guillerme (Paris):

Water In Northern French Cities From Roman Empire To Industrial Revolution

Water in cities operates within four historical schemes. Firstly, in the Roman period water is political (aqueduct for thermes) and sacred (white water (calcareous) derived for cities defences). During the Medieval period water is used for feudal defences, energy (water mills), transportation (load charges and wood), chemistry (wool, leather, parchemin); dynamics is the paradigm of water; one third of cities look like little Venices.

In the modern period, water is used against weapon in larger and larger defences round cities, it is used also for elaborating leather, linen, paper, salpeter as a allied of fermentation, it is used as steam; statics is the paradigm of water; half of cities looks like Venice. During the Industrial Revolution, in cities water disappears from ground surface, it is buried for sanitation, for opening and washing the cities (defences are now closed to frontiers), compressed for high

pressures, disqualified to be as ordinary as possible for domestics and industrial uses. As part of nature, water should be totally controlled by Sciences and Technology (engineers): static water should be dynamised, stream water should be statised.

Andre Guillerme is Professor of History of Technology at the Conservatoire National des Arts et Metiers (CNAM), Paris, director of the History of Technology Center (CNAM and Ecole des Hautes Etudes en Sciences Sociales), and director of the Group of Scientific Interest "Urban Soil" of the CNRS. His most recent book is *Batir la ville - Révolutions industrielles dans les matériaux, 1760-1840* (Paris, 1995). He is currently preparing a monograph on the history of the Seine river, which will be published in late 1999.

David Hardiman (University of Warwick):

The Politics of Water in Colonial India

This paper will attempt an overview of changes in institutional arrangements for the storage of water for the purposes of irrigation, drinking and domestic usage during the colonial period.

Despite the sophistication of many of the pre-existing systems, the colonial rulers held them to be rudimentary, 'primitive', and unchanging, trapping the people in a culture of backwardness. The new rulers believed that they had a superior knowledge which was scientific, and that they could transcend these supposed limitations through technology. Nature could be mastered, transformed and thus exploited in the context of global markets. 'Natives' were expected to conform to this new, more 'rational' scheme of resource use.

Colonial rule brought, in Marx's phrase, a 'disenchantment with nature'. Water resources lost their mystery, and came to be seen as a commodity. Rivers were to be engineered, controlled, tamed and made into a source of artificial 'rivers' (canals). The colonial state taxed water at all levels - water rates were an integral part of land-tax systems. In this respect, water was treated as an asset with market value. The paper will examine the advent of state-controlled water supply, for instance municipal water works, in areas previously untouched. This is a 'secular' water, and does not belong to any caste. This system has egalitarian possibilities, but it is not controlled by anyone apart from the state, and is supplied inefficiently and inequitably.

The issue of irrigation from wells will be addressed, paying particular attention to Gujarat. In the late nineteenth and early twentieth centuries, encouragement and state loans were provided for the digging of wells and the use of motorised pumps. The modern system of selling water appears to have developed out of this.

David Hardiman is a lecturer at the Department of History, University of Warwick, UK. He specialises in the modern history of South Asia, particularly during the British colonial period. Recent publications include 'Small-dam systems of the Sahyadris', in D. Arnold and R. Guha (eds.), *Nature, Culture, Imperialism: Essays on the Environmental History of South Asia* (OUP, New Delhi, 1995).

David Henkel (University of New Mexico):

Bioregional Planning before the Europeans: A Profile of Pre-Columbian Regional Water Management

Survival in the drylands of the world historically have required people to adapt their subsistence strategies to the limits of local water resources, and the range of natural systems particularly sensitive to aridity. Agricultural cultivation, game management, timber harvesting, and the collection of medicinal plants are examples of activities affected by moisture deficits.

Indigenous communities in the north-western part of Mexico and the south-western part of the United States developed water resource strategies which permitted large populations to thrive well before the advent of the Europeans. This paper profiles the sophisticated approaches adopted by the people of Paquimé in the northern part of the Sierra Madre Occidental, those of the Hohokam in what is now south-central Arizona, and of the Chacoan people in the Four Corners region, and compares its effect upon the landscape to contemporary practices.

David S. Henkel, Jr. is an Associate Professor at the School of Architecture and Planning of the University of New Mexico, Albuquerque. He specialises in natural resource management, and has taken part in various projects both in the US and overseas. His publications include "An Ecological Baseline Model for the U.S.-Mexico Border Region." with Susan Butler, Co-Principal Investigator, NM Engineering Research Institute (US Environmental Protection Agency, 1997), and "The Application of Rapid Appraisal Techniques to International Environmental Assessment in Small Communities." International Planning Studies. Cardiff, Wales, UK, is due for publication this year.

Joao Luiz Hoeffel (Universidade Sao Francisco, Sao Paulo) and Suzana Padua (Instituto de Pesquisas Ecologicas, Brasilia):

The conservation of water resources and regional transformations - The Cantareira Reservoir Case.

The current environmental debate reflects the need to change human actions to preserve the Earth's natural heritage. To promote the necessary changes, it is important to create legal systems, but these alone do not necessarily lead to conservation projects. Therefore, education programmes that involve local communities are crucial to preserve the planet's biodiversity.

In the State of Sao Paulo, many protected areas have been created in the last ten years. One of the most important of these areas is the Piracicaba River Environmental Protected Area (EPA) created to preserve this unique watershed, which supplies water to the two of the State's largest cities, Sao Paulo and Campinas and to protect the Cantareira Reservoir. A project, based on a participatory approach, was designed to survey the environmental characteristics of the Piracicaba River EPA and to analyse the impacts caused by the construction of the Cantareira Reservoir. Results are indicating that, in spite of having an expressive area of Atlantic Forest,

representing an important water source and of being considered a priority for conservation projects, the actual economic activities are threatening the entire region. To revert this situation, new economic alternatives, that need low levels of investments, should be offered to the local communities in conjunction with environmental education programmes.

Joao Luiz Höeffel teaches at the University of São Francisco, São Paulo, where he also coordinates the graduate Environmental Science Programme. For the past decade, Mr. Höeffel has been coordinating courses on environmental ethics and values in several education institutions. He works as an invited researcher at IPÊ (Institute for Ecological Research) and the Peirópolis Foundation.

Suzana Padua has a Master's degree in Environmental Education from the University of Florida. She has worked as a consultant in many environmental projects, and is the president of IPE - Instituto de Pesquisas Ecologicas (Institute for Ecological Research), an NGO dedicated to conservation of natural life and biodiversity in Brazil.

Laurent Honnoré (University of Louvain-la-Neuve, Belgium):

Water Supply in 19th Century Belgium. Evolution of municipal equipments and characteristics of distribution networks

This paper deals with the evolution of water municipal equipment in the 19th century in Belgium, until the foundation of the 'Société nationale des distributions d'eau' in 1913.

In a brief introduction, the concept of water supply in the context of 19th century industrialization and urbanization will be defined. 19th century Belgian public health legislation will also be described. According to the French laws of 1789-1790, enforced in Belgium since 1795, the public health policy depends on municipal institutions. These laws remain in force through the 19th century and even the First World War. Unlike other European countries, no general sanitation law was enforced in Belgium before 1945. So the part of governmental action in public health is quite limited. The government will only act through encouragements, technical institutions and principally through subsidies allocated to municipalities from the 1850s. Because of the high costs of water equipment, the subsidies were essential for most municipalities. Provincial authorities also provided subsidies in this matter.

The characteristics of municipal water equipment in Belgian towns and villages will be analysed, principally using printed enquiries conducted in 1906, 1909 and 1912. The growth in the number of distribution networks since the 1850s will be analysed. Brussels was the first great town which acquired such a network in 1855. Liège was the second in 1868, then the movement speeded up. In 1912, it was estimated that about 20% of Belgian communes owned a water network. But the distribution of these networks on the Belgian territory was quite unequal. The great cities in the south of the country were privileged. Moreover, many of these networks were rudimentary and served a small proportion of the population. According to an inquiry of 1906, only 20% of Belgian homes consumed water supplied from a distribution network. Other homes used water coming from wells (70%), pumps, fountains, cisterns or streams. Another enquiry of 1912 estimated that only 30% of Belgian people used pure water. 70% consumed poor quality water,

often contaminated by cesspools, sewers and other sources of contamination, so that hydric diseases, such as typhoid fever, remained endemic in the Belgian countryside until the beginning of the 20th century. Finally, the quantity of water available was often far from the 100-150 liters per day per person presumed to be necessary.

At the end of the 19th century, some communes joined their efforts and founded intercommunal societies. But despite a law voted in 1907 to encourage this sort of initiatives, few intercommunal societies came to light. The communes were indeed very concerned about their autonomy. Most of the communes developed their networks themselves. Private companies were operating in only three cities (Gand, Louvain and Namur).

In the communes which owned a distribution network, the main capitation pattern was the capitation of underground waters coming from sources of drains. Few communes used artesian wells or surface waters. Only two towns owned a double network, the first one providing drinking water, the second one supplying water for public uses (cleaning of sewers and spraying of streets). Concerning the adduction of distribution methods, ¼ of the networks in 1912 used raising machines to bring the water to the consumers. Most of them used water tanks to prevent interruptions in the distribution.

Laurent Honnoré has held the posts of History Tutor at the Institut Supérieur de Formation Sociale et de Communication, Brussels, and of Research Assistant at the Université Catholique de Louvain. He is currently preparing a PhD thesis on the municipal public health policy of the city of Mons, 1830 - 1914, under the supervision of Professor Paul Servais

Donald C. Jackson (Lafayette College, Pennsylvania):

Knowing Nature, Knowing Culture: John R. Freeman and the Engineering of Hetch Hetchy Reservoir, Yosemite National Park (1910-1913)

America's first major environmental/political conflict over large-scale dam building came in the early 20th century when San Francisco initiated plans to flood Hetch Hetchy Valley in Yosemite National Park. These plans to increase the city's water supply were vehemently opposed by naturalist John Muir, who believed the project would needlessly destroy a pristine and beautiful valley. To counter this opposition, San Francisco hired consulting engineer John R. Freeman to document the need for damming Hetch Hetchy. Along with devising a comprehensive technical justification in language the average citizen could understand, Freeman addressed the arguments of Muir and his Sierra Club allies in the political arena of Washington D.C. and established - in real political terms if not in a more expansive historical sense - the importance of encouraging civic development at the expense of wilderness preservation.

The story of Hetch Hetchy's 'loss' has been well told from the perspective of environmentalists. But Freeman's actions as both engineering expert ('knowing nature') and political advocate ('knowing culture') are central to any complete understanding of how Hetch Hetchy came to be dammed and they have heretofore received only minimal historical attention. Without adopting a posture that Freeman's arguments were either necessary or correct, this paper nonetheless

reorients analysis of the controversy by placing his activities as both engineer and advocate in the foreground. In a broader context, such analysis also highlights the character of engineering as wilful, creative action rather dispassionate pursuit of goals defined solely by abstract (and supposedly) scientific requirements.

Donald Jackson is Associate Professor at the Department of History, Lafayette College, Easton, Pennsylvania. He is the author of *Building the Ultimate Dam: John S. Eastwood and the Control of Water in the West* (Lawrence: University Press of Kansas, 1995), which was awarded the title of Outstanding Academic Book for 1996 by *Choice*, the official publication of the Association of College and Research Libraries.

Eva Jakobsson (Royal Institute of Technology, Stockholm):

The history of flowing water policy in Sweden: from natural flow to industrialized rivers

This paper will discuss a water history of an area with abundant water; a Swedish water history from the middle ages to the end of the 20th century. As in areas with shortage of water man has tried to make himself independent from nature by fettering the water circulation. Historically, natural flowing as well as developed rivers call for political as well as technical control. In that respect the relations of power in the society are reflected in the way the water circulation is dominated.

The paper will also address the fact that studies of water development can not be restricted to measures taken in the rivers and watercourses only. Water policy must be seen in relation to other measures, such as drainage, lowering of lakes and clear cuttings, which all contribute to changes in the water balance of the landscape. Alterations in the water circulation are distributed both upstream and downstream, and the changes affect both humans and ecosystems, regardless of the historical context. The structure and scale of the conflict of interests is, however, dependent on the historical situation and the level of technology. These water related conflicts and systems of norms regulating the conflicts as can also be seen as reflecting social relations, rather than, for example, climatic or geographical conditions. In the paper I want to establish which interests were given priority, which were put into effect and which caused conflicts. By giving examples from Swedish history the effect specific historical circumstances on alterations in the water circulation can be established.

To describe the development of rivers during the 20th century the concept of 'industrialisation of the rivers' is introduced to convey the transformation from natural to developed rivers. The concept is associated with homogeneity, maximisation, rationality, management and large-scale. Developed water courses become technical systems.

Eva Jakobsson is a historian working as a researcher at the Department of History of Science and Technology at the Royal Institute of Technology in Stockholm. Her publications include 'Industrialised Rivers: The Development of Swedish Hydro-power', in A. Kaijser and M. Hedin (eds.), *Nordic Energy Systems. Historical Perspectives and Current Issues* (Canton, Mass. 1995).

Mark Jenner (University of York):

The Invention of Dirty Water: Purity and Profit in the History of London Water c.1790-c.1830

Irene Maver (University of Glasgow):

Scottish Water: Reactions and Resistance to Municipal Control in the Mid-Nineteenth Century

The municipal acquisition of water supplies in nineteenth-century Scotland almost invariably has been depicted as a triumph of commitment to the common good and community well-being. This enduring image of enlightened civic interventionism was strikingly exemplified by the city fathers of Glasgow during the 1850s, who resorted to a range of rhetorical devices to rally public support.

With urban regeneration at the heart of their public relations campaign, they aimed to deflect criticism relating to high levels of expenditure, vested interests and intrusion into personal property rights. The intensity of their efforts indicated anxieties about the strength of opposition to municipal control, and especially the damaging impact of political divisiveness over the water issue.

The Glasgow experience will be considered in some depth by this paper because of the substantial scale of water operations in the city and the pioneering role played by the civic authority in the Scottish municipalisation process. Glasgow set a precedent for others to follow in the 1860s, when Aberdeen, Dundee and Edinburgh shifted from private to public ownership. However, because the comparative approach has so far been rare in the history of Scottish water provision, the Glasgow example will be set in the context of the varied responses to the water debate in other cities. The aim will be to show that the retrospective image of Scottish water did not necessarily equate with the contemporary political reality, which could be controversial.

Dr. Maver is a Lecturer in Scottish History at Glasgow University. She is co-editor (with Hamish Fraser) of *Glasgow, Volume II: 1830 to 1912*, (Manchester, 1996). Her single volume history of the city, simply called *Glasgow*, will be published by Edinburgh University Press later this year

William McGucken (University of Southern Indiana):

Lake Erie Rehabilitated: The Occurrence and Control of Cultural Eutrophication, 1960s - 1990s

The cultural eutrophication - i.e. over-fertilization from human activities - of lakes emerged as a serious international problem during the early 1960s. Before the end of the decade, scientists had explained that to control eutrophication would require, in most instances, reducing the amounts of nitrogen and phosphorous entering the aquatic environment.

In North America the most publicized instance of eutrophication occurred in Lake Erie, one of the Great Lakes shared by the United States and Canada. In 1964, the national governments, anticipating the public outcry that soon was heard, requested the International Joint Commission of the United States and Canada to investigate the problem and report with recommendations, which it did in 1969. The commission diagnosed Lake Erie's problem as excess phosphorous, and recommended that each country reduce the amount of phosphorous entering the lake from municipal and industrial treatment plants and from agricultural lands. Furthermore, as a large percentage of municipal phosphorous originated in the recently introduced phosphate detergents, the commission recommended that their phosphate content be greatly reduced and even eliminated.

The commission's diagnosis was sound, but it would be a quarter of a century before its recommendations would be implemented, to one degree or another on either side of the border, and eutrophication controlled in Lake Erie. During that period, some, with the backing of the detergent industry, would challenge the claim that phosphorous was the problem; each country would undertake a massive and expensive program of municipal sewage treatment plant construction; and each would reduce tillage practices that reduced the input of phosphorous from agricultural lands. By the mid 1980s the first signs of the recovery of Lake Erie were noted, and a decade later the International Joint Commission pronounced the overall remedial program successfu.

The rehabilitation of Lake Erie was driven fundamentally by values that Canadians and Americans shared and expressed in the environmental movement that also had emerged during the 1960s. They wanted primarily to maintain the lake as an amenity beside which to live or vacation, and for outdoor recreational activities, including swimming, boating, and fishing. Some were aware and appreciated that the lake was the source of their domestic water supplies and also that a healthy economy required a healthy environment, while others viewed the lake as a splendid aquatic ecosystem whose integrity should be protected for its own sake and for aesthetic reasons. All had been appalled to learn that this large body of water was experiencing eutrophication and had immediately called upon their local, state, provincial, and federal governments to take corrective actions.

William McGucken is Professor and Chair of History at the University of Southern Indiana, where he teaches history of science and environmental history. His book on the control of cultural eutrophication in Lake Erie will be published later this year.

Martin Melosi (University of Houston):

Pure and Plentiful: From Protosystems to Modern Waterworks in the United States, 1801-2000

Water supply, like other sanitary services, has been and remains indispensable for the functioning and growth of cities; it is part of the urban circulatory system. Sanitary services are not organic entities, but specialized technical systems--technologies of sanitation--which help to shape the apparatus of modern cities. In addition, the study of urban water supply is an important vehicle for revealing environmental thought as it relates to urban life and city development.

This paper will treat major themes in the development of urban water supply systems in the United States, beginning with the Fairmount Waterworks in Philadelphia to modern systems. Central to the discussion will be technical changes in sources of supply, distribution networks, filtration, and treatment, with an eye to the environmental implications of the evolving systems.

Modern city-wide water-supply systems were conceived in an Age of Miasmas (prior to 1880). The structure of those systems and their functions were linked inextricably to the goals of environmental sanitation, that is, to utilize the prevailing sensory tests of purity to deliver a product that would not only be free of disease but also would be utilized to mitigate against disease. By the Era of the New Ecology (after World War II) there emerged a greater awareness of environmental inputs and outputs, which could help maximize the value of sanitary services like water supply. However, traditional emphasis on permanent, centralized systems, going back at least to the turn of the twentieth century, ultimately exposed limitations in their functions. While modern waterworks were relatively successful in coping with many biological and chemical pollutants, they faced severe challenges in dealing with nonpoint and groundwater pollution. The record of American water supply systems over the course of two hundred years, therefore, was decidedly mixed.

Martin Melosi is Professor of History and Director of the Institute for Public History at the University of Houston. He is a past president of the American Society for Environmental History, the National Council on Public History, and the Public Works Historical Society. His most recent book, *The Sanitary City: Urban Infrastructure In America From Colonial Times To The Present*, will be published by Johns Hopkins University Press in Autumn, 1999.

Sarah O'Hara (Nottingham University):

Water conflicts in Central Asia: past events, present problems and future scenarios

In recent decades much has been written on the subject of 'water wars' and many observers believe that as we approach the twenty-first century, water and water supply systems are increasingly likely to be the focus of military action (Gleick, 1993; *Economist*, 12th August, 1995). In an attempt to identify potential 'hot spots' various indices have been developed which assess a nation's vulnerability to water-related conflicts (see for e.g. Myers, 1993; Gleick, 1993). Areas considered to be particularly 'at risk' include the Middle East where water resources are not only scarce, but also are shared by more than one state, and where population and per capita demand for water is growing.

With the break-up of the Soviet Union and the emergence of independent states a new area of potential conflict has emerged: namely Central Asia. Here the combination of limited and unevenly distributed water resources, rapid population growth, a high level of dependency on irrigation agriculture, and large poorly managed, highly integrated irrigation systems are considered by some observers (e.g. Gleick, 1993; Smith, 1995) to be the ingredients for future conflicts at both a national and international level. Local government officials, however, have

been quick to deny any suggestion of disagreement over the partitioning of water resources (Turkmen Press News Agency, 18th April 1996). This paper will provide a brief overview of water conflict in Central Asia. In particular it will focus on the current situation highlighting area of conflict at present and assessing the potential for conflicts over water in the future.

Dr. O'Hara is a Lecturer in Environmental Issues of Eastern Europe and the former Soviet Union in the School of Geography, University of Nottingham. She has just completed a three-year ESRC fellowship investigating the Social and political constructions of water management strategies in Turkmenistan. Currently in press is her article 'Managing central Asia's water resources: prospects for the 21st century', *International Journal of Water Resource Research* (1999).

Andrés Sánchez-Picón & Juan García-Latorre (University of Almería):

'They live in the water'. The Economic and Ecological History of water resources in an arid country

South-eastern Spain (the provinces of Almería, Murcia, Alicante and parts of Granada) is the most arid zone of Europe. Precipitations range from 200 to 300 millimetres per year. Mountains and lowlands are deforested, and desert landscapes dominate the zone. However, there is no strip of land without traces of human activity. The most surprising of them are abandoned terraces (that cover thousands of hectares from the valley floors to the tops of the mountains) and old agricultural hydraulic systems which are everywhere: channels, wells, water-wheels, reservoirs and big underground galleries. Some of the galleries are several kilometres long and were built under dry rivers. As archaeologists recognize, it is very difficult to date these systems. Besides, the historical context in which they were built is unclear.

Islamic agriculture is based on irrigation, and no environmental factor - for example aridity - can explain this land-use system completely. The explanation is rather in social factors than in the environment. Islamic society in Spain was not a feudal society, and this is the key to understand the importance of irrigation in the middle ages. However (in our study area) Muslims exploited surface water mainly. It has recently been discovered that more than 50% of 'old' hydraulic systems are modern and were made between 18th and 19th centuries. On the other hand, we now know that the environment has changed dramatically since the expulsion of the Moorish in the 16th century (when big forests and forest fauna such as bears, deer, roe deer etc. existed in South-eastern Spain).

In this paper an analysis of the relationships between irrigation systems and the economic and environmental context in which they were built, from the 16th century to the 20th, will be developed.

Juan García-Latorre is a member of the interdisciplinary governmental project at the University of Almería concerning the relationship between economy and environment in the history of southern Spain. He has written several papers on environmental history of southeastern Spain. Andrés Sánchez-Picón is currently Professor of Economic History at the University of Almería.

He supervises a governmental interdisciplinary project on the relationship between economy and environment in the history of southern Spain during the 18th-20th centuries. He has published several books and papers on 19th century Andalusian economy and related environmental problems. He is the editor of *Historia y medio ambiente en el territorio almeriense* (Universidad de Almería, 1996).

Philip Scarpino (Indiana University):

Borders and Boundaries: an examination of Canadian/American efforts to regulate water quality in the great lakes.

During the late 1960s and early 1970s, Canada and the United States attempted to solve a cross-border environmental crisis associated with the Great Lakes. The spectacular and much-publicised ‘death’ of Lake Erie added urgency to the problem of water quality in the lakes and helped galvanize a public constituency for environmental regulation in both Canada and the US. Against this backdrop, ‘Borders and Boundaries’ will focus on the Canada/Ontario agreement (1971) and the Great Lakes Water Quality Agreement (1972) as lenses through which to examine and analyze the long and complicated struggle to control pollution and regulate water quality in the Great Lakes.

Americans and Canadians approached the shared water quality problems of the Great Lakes within a context characterized by similar values towards nature and quite different attitudes towards each other. Prime Minister Pierre Trudeau (1968-79, 1980-4) was often quoted in the press as describing the US/Canadian relationship as similar to sleeping with an elephant. While many Canadians understood and agreed with Trudeau, most Americans knew very little about Canada and were unaware of the powerful and ambivalent feelings of Canadians towards their neighbours to the south.

‘Borders and Boundaries’ will concentrate on the decade that preceded the signing of the Canada-Ontario agreement and the Great Lakes Water Quality Agreement. It will argue that the borders that separated the two nations were more than simply lines on a map; they also consisted of cultural boundaries that influenced how people understood themselves, others, and their surrounding environment. The paper will further examine differences and similarities between US and Canadian systems, on federal and state/provincial levels which influenced how each nation answered the question: Who has the authority to regulate the environment?

In order to provide a comparative perspective, ‘Borders and Boundaries’ will draw on research conducted over a several-year period at the Canadian National Archives, the Canadian Department of Foreign Affairs and International Trade, the Canadian Privy Council, Environment Canada, the Ontario Provincial Archives, and the US National Archives. This approach will highlight and compare differences and similarities between the US and Canadian systems, as the two countries attempted to solve common environmental problems and deal with each other at the same time.

Philip Scarpino is chair of the Department of History at Indiana University. He works primarily in the fields of public history and environmental history, and has served as consultant to a number of museums that were mounting exhibits with environmental themes. He is the author of *Great River: An Environmental History of the Upper Mississippi*, and is co-editor (with Martin Melosi) of the forthcoming *Public History and the Environment*.

John Sheail (National Environment Research Council, UK):

'A barrage of poisonous water' - the river Tees as both a political and scientific laboratory for the use of watercourses in inter-war Britain

The commonly-used expression, 'man's impact on the environment', implies two separate systems acting on one another. Closer study has shown them to be essentially one and the same thing. By constantly and actively transforming nature, human activity is similarly always adapting to what are, in effect, 'constructed ecosystems'. This increasing appreciation of the spatial complexities and dynamism of such relationships has encouraged scholars to look anew at the graphic detail contained in nineteenth-century Blue Books and local archives. Not only were the industrialised parts of Britain among the earliest to experience large-scale water pollution, but there was the pressing need to find more sustainable ways of incorporating those watercourses within the economic and social life of communities.

The paper broadens the historical perspective by focusing on the inter-war years, and the increasing role accorded to central government and national trade associations in maximising the utility of such watercourses as the Tees. Local industrial figures, such as Lord Gainford, used the examples set by the Tees Fishery Board and ad hoc Tees Pollution Committee to encourage the Ministry of Agriculture and Fisheries and Federation of British Industries to play a larger part as 'facilitators' in securing the knowledge and understanding and, thereby, the confidence required to predict what would happen if greater cognisance was taken of the interests of all parties in sustaining the volume and quality of river water. Highly relevant insights were gained as to the institutional relationships required by the state, business and other user-interests if the natural resources of each locality, and ultimately the nation, were to play their full part in preserving and enhancing industrial competitiveness and the quality of the British race.

John Sheail is a Senior Principal Scientific Officer in the Natural Environment Research Council and Deputy Head of the Monks Wood Research Station of its Institute of Terrestrial Ecology. An historical geographer, he is an External Professor in Geography in the University of Loughborough. He has written extensively on the recent history of water management in the UK and is the author of *Nature conservation in Britain: the formative years*, published in late 1998.

Patricia Sippel (Toyo Eiwa Women's University):

Controlling the Nagara: Negotiating National and Local Interests in Japanese River Management

The Nagara River flows out of the mountains of Gifu Prefecture in central Japan. For roughly half of its 136-kilometer course, it runs south through narrow valleys. Then, flowing through high dykes, it makes its way across the Nobi Plain before emptying into Ise Bay on the Pacific Ocean. A decade or so ago, the Nagara attracted attention as Japan's last free-flowing major stream. It remains famous as the focus of a centuries-long struggle against flooding, especially on the plain, where two other major rivers - the Kiso and the Ibi - join it in their voyage to the ocean.

This paper explores two aspects of the struggle to control the Nagara: first, the changing accommodation between human livelihood and the integrity of the river environment as the focus of river management; and second, the ongoing negotiation of national and local interests in determining river management policy.

Three major enterprises illustrate the shifts. In 1753, the ruling Tokugawa shogun ordered a distant daimyo family to provide funds and expertise for a complex engineering project that included construction of a wall to separate the Kiso and Ibi Rivers in the south of the three-river delta and a dam further upstream to reduce water flow from the Nagara to the Ibi. Although local residents had requested the work, some resented the management style of the outsiders and expressed doubts about the environmental impact of the restructuring. The modified version of the project, finished in 1755, did little to protect against flooding. In 1896, Japan's newly centralized and modernizing government authorized a new assault on the problem. Using foreign technology and drawing heavily on national and prefectural funds, project managers had, by 1912, separated the Nagara and Kiso rivers and sealed off three major channels that linked the Nagara with the Ibi. Completion of the work marked the end of chronic flooding and opened an era of regional economic expansion. Finally, after a massive typhoon hit the Ise Bay region in 1959, the Ministry of Construction in the national government originated a plan to build a dam at the Nagara estuary. The stated objectives included heightened flood protection and the supply of water to nearby industries. Opposition by some local residents and fishermen's unions and by internationally organized environmental groups slowed, but could not halt, the project. Construction of the dam began in 1988 and finished in 1995.

The three Nagara River projects illustrate significant shifts in the management of Japanese rivers since the early modern era. Throughout, national or quasi-national governments have designed policies and have produced the bulk of construction funds. None has hesitated to authorize ambitious environmental engineering to meet the demands of human livelihood and economic advantage. But the discontinuities are equally of interest. In the midst of large-scale restructuring in the eighteenth century, both government officials and local residents modified their plans because of environmental concerns. That hesitation to embark on extreme or unnecessary change was seemingly submerged in the modernizing years of the late nineteenth and early twentieth centuries. Supported by a growing international environmental movement, it was revived in the recent controversy over the Nagara estuary dam, locking central government ministries and local residents in a conflict that could not be resolved.

Patricia Sippel gained a Ph. D. in History and East Asian Languages from Harvard University in 1994. She is currently Associate Professor of Japan Studies at the Toyo Eiwa Women's University, Yokohama, Japan. Her recent publications include 'Abandoned Fields: Negotiating Taxes in the Bakufu Domain,' *Monumenta Nipponica*, Vol. 53, No. 2, Summer 1998.

Brit Allan Storey (US Bureau of Reclamation):The Bureau of Reclamation and International Water Development

The paper will outline the history of Bureau of Reclamation water development projects in the American West, including the Hoover Dam, Grand Coulee Dam, Shasta Dam, Arrowrock Dam, Buffalo Bill Dam, Belle Fourche Dam and Anderson Ranch Dam. It will also look at the role of the Bureau in hydropower development, focusing on the Hoover Powerplant and the Grand Coulee Powerplant, Third Powerhouse (including discussion of international agreements with Canada which were necessary for the project to proceed effectively).

The role of foreign technicians trained in the Bureau of Reclamation will be addressed, as will Bureau of Reclamation employees' and retirees' work on projects in other countries. The paper will examine the concept of the 'lag' between Reclamation involvement and construction. During that lag, a major gap developed between USBR approaches to public involvement, 'transparency', and environmental issues, and approaches in other parts of the world.

The paper will discuss American environmental lessons learned in the period between involvement and construction, and will study the implementation of projects and their effects, including such schemes as the Three Gorges Dam, the Pa Mong project on the Mekong Delta, and the Blue Nile River Basin resources assessment. The evolution of water development projects internationally, particularly as influenced by international money sources such as the World Bank, will be addressed.

Brit Storey is the Senior Historian of the US Bureau of Reclamation. Prior to his appointment in 1988, he held the post of Assistant Professor at Auburn University, worked for the State Historical Society of Colorado and for the Advisory Council on Historic Preservation. He is currently undertaking a Centennial History Programme and an Oral History Programme, and is working on other special studies of Reclamation projects.

Barbara Tellman (University of Arizona):European Impacts on Water Supplies and Rivers in the Arid Regions of the American Southwest - 1700 - 2000.

The first Spanish explorers and missionaries to arrive in the Southwest in the late seventeenth century started a series of changes in the way water was used, in attitudes towards water and flowing streams, and rules on how water was apportioned. Later settlers from other parts of Europe, especially the British Isles, accelerated those changes and introduced new types of changes, most decisively from the period after the American Civil War to the present.

Developments in technology played a major role, including the arrival of the railroad, the invention of high powered pumps that could draw water from deep underground, and

construction of large dams that changed the character of the rivers forever. The rivers were also changed by actions such as the introduction of exotic plant and animal species, development of irrigated agriculture and the growth of cities. Because the rate of change was extremely rapid and involved the migration of millions of people not accustomed to living in hot, arid regions, the possible consequences of those changes were not anticipated or well considered by decision-makers. This paper will look at the major impacts of humans on surface and groundwater over the 300-year period, with emphasis on the past 100 years. It will (in a non-judgmental way) contrast the environment, water use and outlook in the area prior to the European conquest with that of the present day and discuss a range of causes and effects.

Barbara Tellman is a Senior Research Specialist at the Water Resources Research Center, University of Arizona, in Tucson, Arizona. She is the author of numerous publications on topics of water law, water policy, water history, riparian area issues, and exotic species. Her book, *Arizona's Changing Rivers: How People Affected the Rivers* (1997) documents the multiple impacts of human activities from prehistoric times to the present.

Terje Tvedt (University of Bergen):

The British Nile

The paper will deal with water politics and water control works in the Nile valley, especially during the time of British rule. It will focus on how the British water planners and political strategists conceptualized the river and its development potentials at the turn of the 20th century, and how this affected local and regional politics up to the present day.

Terje Tvedt is Research Director at the Faculty of Social Science, University of Bergen, Norway. He has been working on the history of the River Nile for many years, and will this year finish a monograph on its history as well as two multivolume bibliographies on the River Nile and on the Southern Sudan.

Thomas Zeller (Deutsches Museum, Munich):

The River as Compromise: The Isar in Bavaria, 1880-1930

That the Isar River is a tributary to the Danube and flows through Munich, were almost the only two qualities which were not contested during a big debate about the meaning and use of the Isar starting in 1880. Different interests and motivations brought forward by different societal groups coalesced in the physical shaping of the river. Doctors and hygienists recommended straightening the river, thereby lessening the dangers of flooding for disease-stricken working-class neighborhoods of Munich. A newly established river administration sought control over the river to regulate land use on its banks. Engineering visionaries promoted the idea of hydro-electric power as a basis to modernize the predominantly agricultural Bavarian economy. Proponents of early conservationist groups acknowledged the need to harness the hydro-electric potential of the river, yet promoted an aestheticized version. This paper will analyze the interests and motivations

of these respective groups and their relative degrees of success in the physical reshaping of the river. It argues that economical interests and seemingly uneconomic, aesthetic concerns could easily be negotiated together. The results of these conflicts was compromise serving contemporaneous needs and norms of beauty and industrial performance. The ‘taming’ of the river transformed a potential natural menace into a cultural artifact in need of new meanings. Thereby, the Isar could be integrated into efforts to constitute a distinctly Bavarian identity.

Thomas Zeller works at the Deutsches Museum in Munich. He studied modern history, social and economic history, and political science at the University of Munich and at Temple University in Philadelphia. He received a Ph.D. degree in modern history from Munich University in February, 1999.