PARISIAN SWIMMING POOLS OF THE NINETEENTH AND EARLY TWENTIETH CENTURIES, EXAMPLES OF "SUSTAINABLE DEVELOPMENT" AND SAVINGS

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Swimming Pool History, Grey Energy, Energy Recycling

Abstract

While studying the restoration purpose, the architectural organization, technical equipment and devices of the Henri Sauvage's 1926 rue des Amiraux swimming pool, I discovered that since 1783 most Parisian swimming pools systematically recycled energy, using natural warm water or existing embodied energy. Some swimming pools were reused the heat of an existing boiler, often a steam boiler (pump or not) or gas plant. Other pools used natural warm water flowed from artesian wells, an early use of geothermal energy. Few examples fits in buildings or part of buildings already existing and thus, saved a great amount of building costs. The housing block surrounding the Amiraux swimming pool forms an insulation mass around the sports area. This paper presents a series of case studies of a variety of such recycling systems. The choice of those systems was certainly economic but perhaps also moral. At that time, warming such important volume of water, just for leisure, was not considered as a relevant idea.

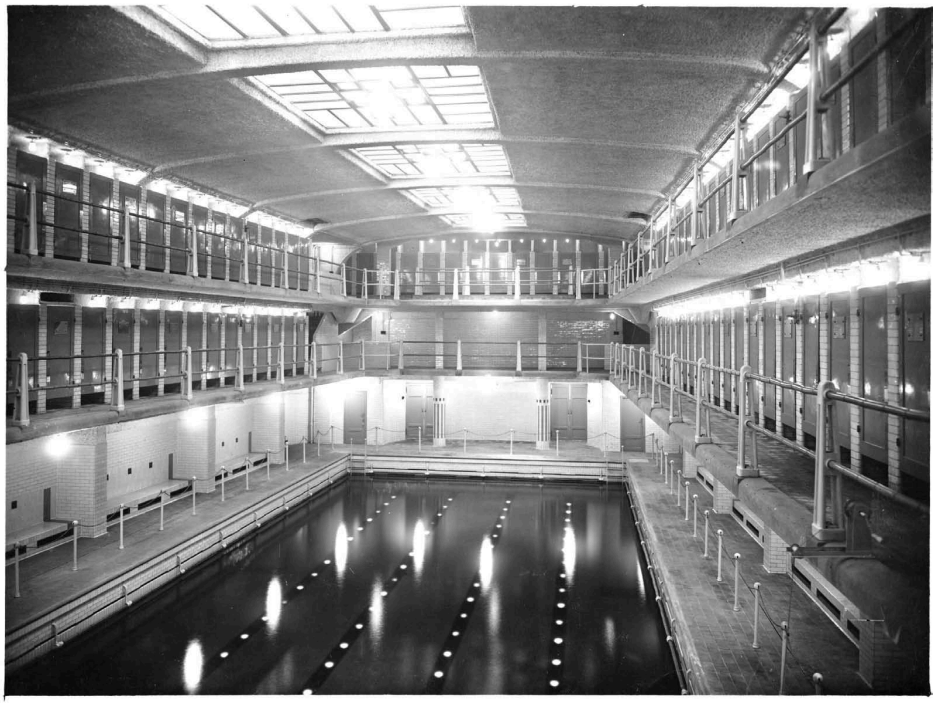

Figure 1: Les Amiraux swimming pool, archive IFA, 018 IFA, P-18-098-019 1916-1927

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INTRODUCTION

While studying the restoration goal, architectural organization, technical equipment and devices of the Henri Sauvage's 1926 rue des Amiraux swimming pool, I discovered that since 1783 most Parisian swimming pools systematically recycled energy, using natural warm water or existing embodied energy. Most available literature on the history of swimming pools focuses on the development of hygiene of sports and leisure or on a social, architectural or urban point of view. These approaches are interesting but not useful for an investigation the original technical operation of the Amiraux swimming pool, mots of whose devices disappeared decades ago. Exploring a wide variety of sources, from public archives and records to nineteenth and early twentieth centuries technical, hygienic and municipal journals, I took an incredible journey in a world of pipes, tanks, filters, boilers, heat exchangers, flows, pressure levels and sewers.

This study of the energy saving behaviour of early nineteenth- through early twentieth-century Paris pools became an interesting counterpart to my work on the energy consumption of contemporaneous public buildings in Paris. Both practices contradict the late twentieth century tendency towards high energy consumption. This paper will focus on the first of these two practices, presenting a series of case studies of different recycling systems employed in the swimming pools of nineteenth and early twentieth-century Paris.

THE ORIGINS

Some of the earliest Parisian warm water swimming pools with warm water, whether outdoors or indoor, used heat generated by an external preexisting heat sources. In 1783, Nicolas Roger recovered condensation from the Perier Brothers' steam pump, installed on the Seine near Chaillot, to fill the pool of his swimming school pool (Artru & Rivière, 2000). In 1817, the Gros-Caillou swimming school, located on the quai d'Orsay, was heated by the same kind of heat pump. This outdoor pool remained functional until 1883. While steam boilers, engines and pumps of the time had limited capacity, and water was scarce, the idea of recycling condensed water was thus put into practice as early as the end of the eighteenth century.

A FIRST GENERATION OF SWIMMING POOLS IN PARIS

In 1875, a design competition for industrial buildings included a swimming pool supplied with warm water from of steam boilers condensate (Le Bas, 2000). The 1880s saw an increase in the number of swimming pools, to the satisfaction of hygienists. Different journals reported on this, nothing the practice of recycling steam engines condensate: "The Prefect of the Seine has approved a decision of the municipal council dated December 11, 1880; proposing the creation in Paris of permanent swimming pools. It is the realization of a wish adopted by the Company of public medicine and occupational hygiene in 1879. But Dr. Napias, our colleague even hoped we could use the condensation of industrial steam engines, to heat these pools. This is an innovation that will greatly benefit safety, sanitation of a large part of the working population of Paris. When the body is washed, collective dwellings were much less likely to become infected and unhealthy" (*Le Génie Civil*, 1881).

In exchange for the year-round use of the warm condensate of the Parisian water raising plants, contractors were required to reserve two days weekly of free access each for the military and for local schools (*Annales d'hygiène publique et de medicine légale*, 1881). Entrance fees were set at 25 centimes for a standard ticket or 10 centimes for indigents listed on city charity bureau rosters.

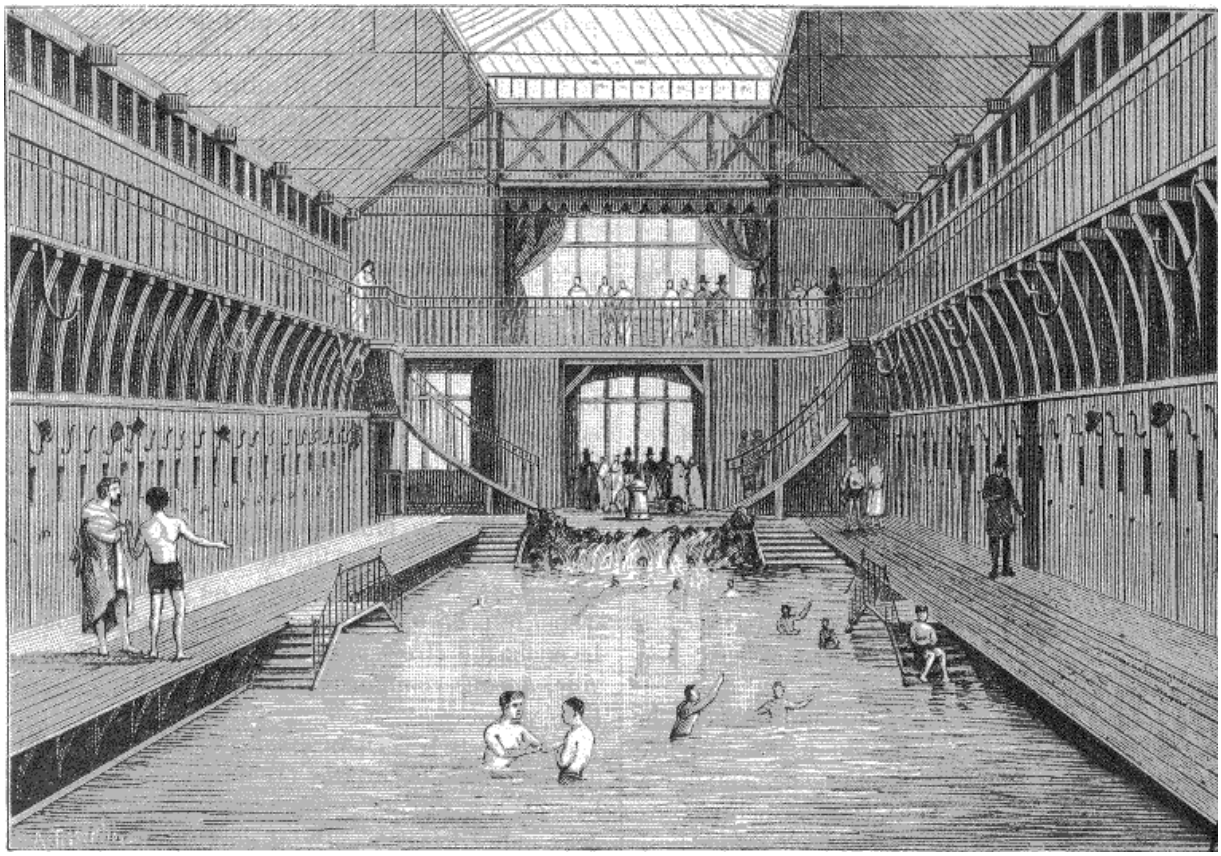

Figure 2: Affordable Bathhouse rue de Chateau-Landon, Paris, 1884, *La Nature*. July 5 (65)

In 1884, at the instigation of the Water Gymnasts' Society and its president Christmann, the first heated indoor pool was built at Château-Landon. To heat the pool, architect Bessières and engineer Philippe Edmond used hot water coming from the condensation of the steam engine of the La Villette water raising plant (Le Bas, 2000). Antoine Le Bas describes the Château-Landon pool building as an iron framed and brick infill industrial structure covered with *Polonceau* metal trusses that supported a glass roof providing overhead lighting and ventilation via operable sky-lights. Individual showers and sinks, as well as a steam room with an ambient air temperature maintained at 60° C, preceded the basin. Surrounded by two rows of changing cabins, the pool itself held water warmed to 25° C.[2]

Built in 1885, Christmann's baths and pool on boulevard de la Gare, designed by the same architect and engineer, recovered the heat of the quai d'Austerlitz water raising plant.[3] Joseph Oller's (1839-1922) 1886 Rochechouart swimming pool, designed by with advice from the engineer Solignac, used the heat of condensation waters from the rue Rochechouart Godillot plant[4]. In 1887, Oller a successful businessman involved in horse racing and leisure spaces created a

[2] Chateau-Landon pool: fifty by twelve meters; boulevard de la Gare pool: sixty-five by fifteen meters.

[3] Christmann created the Société Française des gymnases nautiques, the French water Gymnast Society, thanks to a concession agreement obtained with the City of Paris, which ensured for a low cost the exclusivity of condensation waters of the Parisian water raising machines, against days of free access reserved for the military and for local schools (Cartaz, 1884).

[4] The Alexis Godillot (1816-1893) plant is famous because of the massive production of boots for the French army and also because of a huge destructive fire in 1895. The swimming pool was still opened in 1900, when André Gide, the French writer, came frequently (Gide, 1900).

nautical performance hall rue Saint-Honoré: an amphitheater with a circular ground plan and a large pool in the center. Hall and pool were warmed with two successive ways. Natural water at 12° C was pumped from a depth of 80 meters inside the Parisian subsoil. This water was secondarily heated with the heat of the condensate of the steam engines used to produce the electric lighting (Richou, 1886). The water of the 1889 new municipal Rouvet swimming pool was warmed to 30° C by the neighboring Boulevard Macdonald gas plant (Sée, 1934). At the 1893 Hébert swimming pool the architect Kuffer used an alternative heat recycling system: natural warm water coming from a artesian well (718 meters detpth) was poured in the pool at 26° C[5]. In 1897, the municipal Ledru-Rollin swimming pool recovered the heat of condensation waters of the steam engines adjacent quai de la Rapée water raising plant (Sée, 1934).

Figure 3: Distillation workshop of La Villette Gas plant, heating the Rouvet swimming pool, "Vues des usines et ateliers 1871-79", archives de Paris, cartes et plans 1007.

A SECOND PERIOD OF GROWTH

In terms of numbers of swimming pools, Paris lagged behind other European capitals: in 1922, there were only seven swimming pools, and only twenty in France as a whole, most of them thirty-three meters long[6]. With the eighth Olympics scheduled to take place in Paris in the summer of 1924, the city was in dire need of Olympic-sized swimming pools. To accommodate this special event, two fifty meters long swimming pools were built by the city: the Tourelles pool located Porte des Lilas, and the Butte-aux-Cailles nautical stadium. Like in the Hebert's earlier swimming pool, the Butte-aux-Cailles pool relied on warm water from an artesian well, here located 580 meters below the ground level. Water at a temperature of up to 28° C, flowed to the surface at a rate of up 21 liters per second. Three renewals were possible per day. Designed by the architect Louis Bonnier (1856-1946) the amenity was engineered by the Hennebique office

[5] Artesian well waters flowed from the parisian aquifer ground layer thanks to deep drills around 800 meters depth. In Paris, drillings begun around 1830 and wells flowed around 1890.
[6] Germany: 1362, United-Kingdom: 806 (Champ)

and built by the Baffrey-Hennebique construction company.[7] The Tourelles swimming pool was an outdoor stadium during the Olympics; afterwards the public use was limited at the summer season.

In 1921, the French national assembly voted to authorize the city of Paris to take out sixty years of 1,800 millions franc loan at 6 %. Funds were to be used to close budget gaps of 1920 and 1921, and to finance the rehabilitation of existing municipal properties, and new construction. The city council allocated a portion of these funds to public baths and swimming pool construction and improvements. In 1921, 25 million francs were allocated to creating and improving public baths; and in 1924 and 1926, 20 millions more were earmarked for the execution of a complementary program of municipal swimming pools and public baths.

A model program outlined in 1924 aimed at achieving these objectives. The program stipulated that in winter water temperature in the pool should not drop below 22° C. The recommended air temperature is 25° C for changing rooms, 15° C in offices and other room where work areas and 10° C in hallways and exit stairways. Decided in December 1925 and completed in March 1929, the Blomet swimming pool designed by the architects Joseph Bassonpierre (1871-1950), Paul Sirvin (1891-1977) and Paul de Butté (1871-1943), used naturally heated water from an artesian well supplied at 27 °C (Sée, 1934). After initial difficulties with the pressure, the flow became sufficient to fill the pool: 75 m^3 instead of 150 m^3 per hour. A public bath housing 50 changing cabins completed the amenity. For the city council president Jean de Castellane: "the artesian water supply is undoubtedly the best for the requirements of health and the enjoyment of swimmers" (*Inauguration de la piscine Blomet*).

To make the most of loan funds, the city council, advised by a special committee, prioritized investment in existing buildings. In this manner, the city expected to economize investment in construction. This can be called saving "embodied energy" with or without the recovery of naturally or artificially warmed water. The Hébert, Ledru-Rollin and Rouvet swimming pools were upgraded. The construction, heating and water supply specifications for the Rouvet and Blomet swimming pools outline the following requirements: "this water can be supplied (…) by the plant in an amount ranging from 1,500 to 4,000 m^3 per day and a temperature of 35 to 40° C" (*Cahier des conditions particulières*, 1921).

At the Rouvet pool, grey energy recovered through the restoration of existing structures coincides with and the use of preheated water. At Ledru-Rollin swimming pool, demolition preceded new construction. Built between 1922 and 1927, the project by the architect Jacques Hermant (1855-1930), executed by Paul Lebret (1875-1933) relied on the recycled condensate from nearby water raising plant. In case of a shutdown of the plant it was possible to connect the Ledru-Rollin swimming pool to the very new district-heating network.[8] The transformation of the Tourelles outdoor nautical stadium into a artificially lit and heated indoor pool is example of recycling embodied energy. Thanks to this transformation it was possible to use the pool all the year round. Designed by the architect Louis Bevière with the engineering office Hennebique and the Baffrey-Hennebique building company, the Tourelles Olympic pool designed, was larger than other contemporaneous amenities and fitted with 1,500 seats for spectators (Sée, 1934). Initially, the pool was designed covered and heated after the Olympic games, but the work was delayed, most likely due to conflicts with the architect.[9]

[7] The artesian well was drilled between 1866 and 1903; the water was used for a public bath since 1908

[8] The network of the CPCU: compagnie parisienne de chauffage urbain served since 1928 the area close to the production plant located quai de la Rapée.

[9] A cabal against the architect for exceeding budget could explain the delay (*A propos du Stade des Tourelles*)

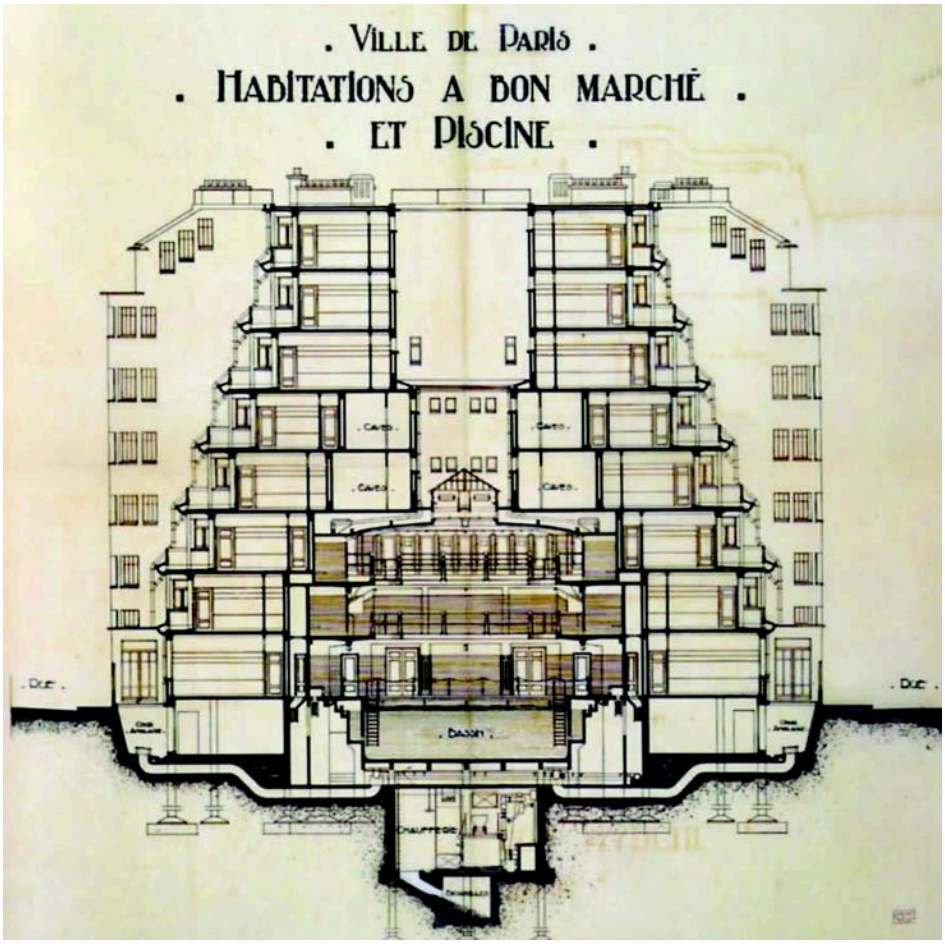

Figure 4: Section of les Amiraux swimming pool, Henri Sauvage, archives IFA 018 IFA B6-23

THE AMIRAUX SWIMMING POOL

In 1926, the city council prioritized the construction of Henri Sauvage's (1873-1932) rue des Amiraux swimming pool project. Using existing housing block envelope, the city, advised by the sport and hygiene committee, aimed to save on construction costs and duration.[10] During the presentation to the town council, the project is described as: "a space has been reserved for receiving the swimming pool, inside the existing building. The reinforced concrete galleries were made along during the construction of the social housing block, by virtue of its location, the pool is already closed and covered"(*Conseil municipal de la ville de Paris*, 1926, July 12).

The pyramidal massing of Henri Sauvage's the housing, offering sunshine and visual comfort to the inhabitants, left a dark void within the block's lower levels. The space could have been occupied by a movie theater, but this was judged too noisy for a residential area. A swimming pool with public baths was judged more hygienic and socially appropriate. The swimming pool occupied the ground floor and the several basement levels, while public baths was located on the

[10] "The sixth committee felt that Amiraux swimming pool, which also include a public baths and which is included in the interior of a social housing unit already partly built, was to be completed in the shortest time and priority before other constructions (…) The completion of the Amiraux swimming pool is decided by priority before other constructions; administration concerned in invited to present a project to the next session." (*Conseil municipal de la ville de Paris,* 1926, March 27).

frontage at the second floor, above the entrance. This choice of space planning saved construction costs using embodied energy.

At the Amiraux pool the approach towards recycling grey energy is additive: the surrounding housing block constitutes a sort of giant exterior insulation for the pool; this time heating costs were saved. The hall is surrounded by: the changing rooms, a technical corridor for the pool, the housing side corridor and living spaces; or by two level of cellars. The only thermally weak part of the hall is the roof level skylight: "The pool hall has a ceiling made by a very flattened arch with the middle part made of glazed" (Sée, 1934). In order to prevent heat via the glazed skylight, Sauvage designed a ceiling under the roof: "we will designed a factice reachable attic, which can received central heating pipes; this attic will be used as a steam and moisture collector, be provided with outlet openings"(*Concours en vue de l'édification de piscine & de bains douches*, 1921). Thermal engineer André Nessi installed 8 Ideal HF-4 steam boilers that produced low pressure steam to warm the 600 m^3 of the swimming pool water to 26° C. This modern building could be understood as a series of overlaid circuits: that of people (bathers and workers), of laundry (clean and dirty), of coal, of ashes, of low pressure steam, of electricity (lighting and power), of water (hot and cold, clean and dirty), of sewage, as well as of air (fresh, warm and exhaust).

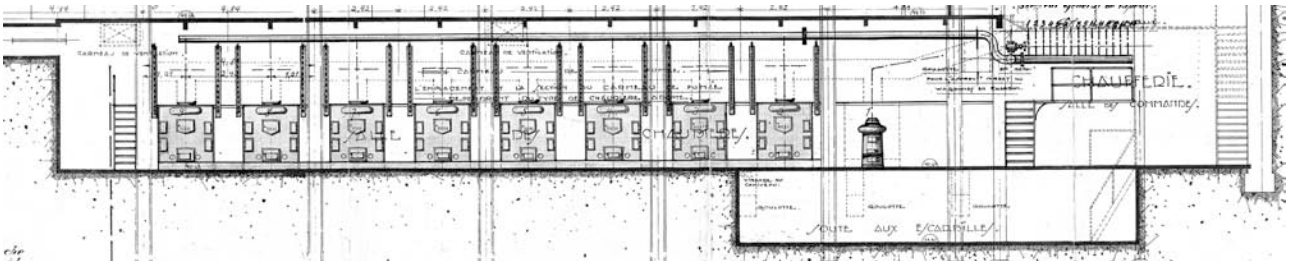

Figure 5: The 8 steam boilers, Amiraux swimming pool, section on the basement, 1926, archives du service local d'architecture, Paris 18e

A VANISHED WORLD

Looking at all the pools listed here, recycling heat or grey energy, we can surmise that in the minds of swimming pools creators and directors, the idea of warming water was not a possible solution for technical and cost reasons, but likely also for ethical ones. Studying energy consumption of public buildings in Paris from the early nineteenth century onwards, I discovered that swimming pools are good examples of the necessary balance between the need of comfort and hygiene for the bathers and swimmers and the importance of saving energy, therefore money, whether public or private. If the heat was often recycled, waters were always changed frequently, because of the primitive stage of hygienic and sanitary water treatments[11].

At the end of the 1930s, few books and papers were published on how to design and run swimming pools. None mention the recycling of natural or industrial warm water. Rather, they propose methods for calculating different water and air heat loss, for sizing boilers and for organizing efficient ventilation (Gillot, 1942). Probably the beginning of a change, which will become fully effective during the "Glorious Thirty".

I hope that this focus on historical examples could be an inspiration for today's work on warm water and grey energy conservation or recycling, systems that could be potentiated by all the new technical means like efficient heat pumps or latent heat storage material.

[11] The entire volume of water of the pool was changed every day or every two days (Nouaille, 1932).

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