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Laplace's Unpublished Manuscript on Associationist Psychology

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The manuscript to be published here for the first time is in Laplace's hand; it is three pages long, entitled *Sur les panorama*. It is undated, but internal evidence would date it to about 1818, in any case prior to the appearance of the 4th edition of Laplace's *Essai philosophique sur les probabilities* in 1819. The manuscript is closely related to that edition, and to a then contemporary cultural and artistic phenomenon, panoramas.

The panoramas referred to were 360 degree paintings with a diameter that could range up to 40 meters, where the viewer would stand in the center and, after a few minutes attention, experience the illusion of being in a three dimensional scene. In his notes on the *Essai*, Bernard Bru speculates (notes 154, 155) that Laplace had in mind two 17-meter panoramas installed in 1800 by a American expatriate ship-owner, James William Thayer (c1765-1835), on boulevard Montmartre in what is still known as the Passage des Panoramas. Or perhaps it was a large panorama commissioned by Thayer, Pierre Prévost's *L'Entrevue de Tilsitt* (1807, seen by Napoleon 1810). Several old panoramas survive in other cities today, including the 40-meter Panorama Mesdag in The Hague and the 40-meter Bourbaki Panorama in Lucerne.

In 1819, Laplace published the 4th edition of his *Essai*, the 3rd edition having appeared in 1816. The major change with the 4th edition was a significant expansion of the section *Des Illusions dans l'estimation des probabilités*. In the 3rd edition this section is on pp. 181-198, 17.4 pages long; in the 4th it covers pp. 194-242, 48.7 pages, nearly three times as long. As evidence that Laplace viewed this expansion important,

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TABLE DES MATIÈRES.

Figure 1. The two-page *Table des Matières* for the 4th edition of the Essai (1819).

consider the fact that with this 4th edition, he expanded the coverage in the *Table des Matières* of this section alone to a full page; every other section in the work received but a single line (see Figure 1). Indeed, the detail he provided in the *Table* for *Des Illusions* is, after the first line, entirely concerned with the newly added material. This new material has not received much attention from historians. One contributing factor may be that, as Dale (1995) notes, the new material was entirely omitted from the first and most widely circulated English translation by Truscott and Emory in 1902, reprinted by Dover in more recent times, without any notice to the reader and contrary to their claim the translation was from the 6th edition (1840) which did include the material.

In the earlier editions, *Des Illusions* had been exclusively concerned with illusions related to probabilities derived from objectively measured quantities. For one example, he claimed that people tended to overestimate the chance of success in the lottery. For another, he offered a corrective to what we now refer to as the "maturity of chances", the naïve gambler's belief that if an event has occurred the same way several times in a row (e.g. a sequence of Heads from a tossed coin or a sequence of male births), then the contrary event (Tails or a female birth) is more likely to follow. Laplace from his earliest work on inverse probability knew that if there was any difference in the chances, it was in the opposite direction. And for a third example, he cautioned about inferring probabilities from incomplete accounts:

> "The coincidence of several remarkable events with the predictions of astrologers, fortune-tellers, and soothsayers, with dreams, with numbers and days reputed to be lucky or unlucky, etc., has given birth to a multitude of widespread prejudices. People do not reflect upon the large number of non-coincidences which have made no impression or which are unknown. However, it is only the ratio of the one to the other that could give the probability of the causes they attribute to the coincidences. If this ratio were known, it would doubtless confirm what common sense and reason tell us regarding these prejudices. Thus the philosopher of antiquity, shown the *ex-voto* [votive offerings] in a temple of all those who (after having invoked the god worshipped there) were saved from shipwreck, put a question in accord with the calculus of probabilities when he asked how many persons have perished despite such an invocation." (*Essai* First Edition, 1814, page 77)

The extensive new material in the 4th Edition went in new directions, to psychology and subjective impressions, as opposed to objective measures. His viewpoint was rooted in earlier work by the Englishman David Hartley (who is not mentioned) and the French philosopher Charles Bonnet (who is cited). (Bru's 1986 edition and Dale's 1995 translation include scholarly notes giving the appropriate references.) That approach has come to be called Associationist Psychology: our actions are in large measure governed by slight, even subliminal clues that we associate with past events or even distant memories. If there was any novelty in Laplace's new material, it was his claim that these associations led to the estimation of probabilities by the same principles that governed with objective data. For example, the evidentiary impact of sense impressions grows with repetition, as with quantitative data. And the illusions based upon sense impressions also follow a similar time trajectory: in estimating probabilities subjectively we overweight recent sense impressions just as we overweight recent data.

Laplace noted that effect of sustained attention would greatly influence the impression, and one example he gave was panoramas:

"These principles explain the singular effects of panoramas. When the artist has accurately followed the rules of perspective, the picture is received on the retina as if it were real. The spectator is then in the same state that he would be in if he were in the real scene. But the perspective given by the artist is never sufficiently exact for the identity to be perfect. Moreover, weak extraneous impressions mix themselves up with the principal sensations that are intended to produce the perspective, interfering with the illusion. By giving due attention to the panorama, this interference can be overcome; but to achieve the effect the attention must be sustained over a time – long or short, dependent on the propensities of the sensorium and the perfection of the panorama. In all those I have seen, an interval of several minutes has been needed for me to acquire a complete illusion." (translated from the 4th Edition, pp. 232-233)

The manuscript *Sur les panorama* is not included in the additional material in *Des Illusions*, but many of its phrases are and some of the text in *Des Illusions* reads like a lightly rewritten version, suggesting that *Sur les panorama* is a previous draft that Laplace later revised to include in the 1819 edition of the *Essai.* For example, consider the single paragraph of the manuscript that discusses panoramas:

"Je viens presentement aux effet, des panorama. L'art de la perspective consiste a tracer sur le fond de la retine, les mesmes images qu'y tracent des objets reels. Mais quelque parfaite que soit le perspective, cette identité d'images n'est jamais entiere. Tousjours des sensations étrangeres, se melent a la sensation principale; mais celle çi par l'attention qu'on lui donne, finit par effacer les sensations accessoires; car c'est encore un principe de l'economie animale, que nous pouvons par l'attention, rendre plus vives, les images interieures, & faire ainsi disparaitre les autres traces qui les accompagnent. Cette disparition n'est pas subité; elle a bien par degrés, & le tems qu'elle exige est plus ou moins long, suivant que la perspective est moins ou plus parfaite. Dans les panorama, ou l'on n'est environné que de perspectives qui se correspondent, on éprouve moins de ces sensations étrangeres, & l'illusion doit etre a la fois plus prompte & plus complette."

Contrast this with the corresponding single paragraph (translated above) on panoramas in the *Essai*:

"Ces principes expliquent les singuliers effets des panoramas. Quand les règles de la perspective y sont bien observées, les objets se peignent sur la rétine, comme s'ils étaient réels. Le spectateur est donc alors dans l'état que ferait naître la réalité des objets. Mais la perspective n'est jamais assez exacte, pour que l'identité soit parfaite. D'ailleurs les impressions étrangères, quoique faibles, se mêlant aux sensations principales que produit la perspective, nuisent d'abord à l'illusion. L'attention donnée au panorama les efface; mais il faut pour cela, un temps plus or moins long, dépendant des dispositions du sensorium, et de la perfection du panorama. Dans tous ceux que j'ai vus, un intervalle de quelques minutes m'a été nécessaire pour acquérir une illusion complète." (*Essai*, 4th ed p. 232-233)

The two passages agree generally in sense and in certain phrases, but they are nonetheless quite different. When Laplace revised his own works, his strong tendency was to change only incrementally, to add or delete words or phrases, or add all new

paragraphs or sections, but not to rewrite existing passages without changing the sense considerably. The inference from this is that he did not have the manuscript at hand when he revised the *Essai*; rather he rewrote anew from memory. By the time of the revision the manuscript was lost or in other hands. The history of the manuscript and how it came to America would seem to support that latter view.

I acquired the manuscript from a San Francisco rare book dealer in 1989, but it arrived in America in 1831 in the possession of Jean-Nicolas Nicollet (1786-1843). Nicollet was a protégé of Laplace's at the Observatoire de Paris from 1817. The definitive source for biographical information about Nicollet is Bray (2008), which new information from his family and from his scattered correspondence, correcting errors in early French biographical accounts. Nicollet was a loyal aide to Laplace, making many observations in support of Laplacian projects, including of the libration of the moon, leading to several publications and his twice being awarded the Lalande Medal. And Laplace was loyal to him, strongly but unsuccessfully supporting his candidacy for membership in the Académie in 1825. On the occasion the vigorous opposition of Jean-François Arago won out, as Damoiseau was elected by a vote of 45 to 3. In his later autobiographical account, Arago described Nicollet as "a man without talent, and, moreover, suspected of misdeeds which reflected on his honour in the most serious degree." (Arago, 1870) Arago's view may have been colored by religion (Nicollet was Roman Catholic) or jealousy (Laplace's preference for a younger man). But in any event, after the death of Laplace Nicollet's path was blocked by Arago. Among other pursuits, Nicollet invested for himself and others in the Bourse, but in July 1830 he was ruined when government bonds suddenly fell 4% and in December 1831 he left without notice for America. Arago was to write, "M. Nicollet had run away to America, and the Bureau des Longitude had a warrant passed to expel him ignominiously from its bosom." Bray implies that the knowledge he would be received by American members of the Sulpician Society, as well as his blocked career and bankruptcy would have made the decision to emigrate an easy one. In America he gained employment with the United States Coast and Geodetic Survey, where he was tasked with mapping the upper reaches of the Mississippi River. The map he prepared with the assistance of John C. Frémont was published in 1843 and was a model of what could be accomplished under difficult frontier conditions. Frémont later gained fame an an explorer (he was known as "the great pathfinder"), served as a U.S. Senator from California, and ran for President in 1856 as the first candidate of the anti-slavery Republican Party (his slogan was "Free soil, free men, Frémont"). Today Nicollet is nowhere better remembered than in Minneapolis, Minnesota, where both a prominent avenue and a shopping mall are named after him.

J. W. Thayer, the entrepreneur behind the Parisian panoramas, made a fortune trafficking in nationalized Church property ("biens nationaux") during the revolutionary period, and his two sons became Sénateurs in the Second Empire. One son, Edouard-James Thayer (1802-1859), entered the Ecole Polytechnique in 1822 and may have crossed paths with Laplace or Nicollet at some point, perhaps even as one of Nicollet's unfortunate investors.

Evidently Nicollet had acquired the manuscript from Laplace, perhaps even in 1818, and kept it with him for the rest of his life. What happened to the manuscript after Nicollet's death is uncertain. It may have been a part of the contents of a box he left with the Coast and Geodetic Survey that was only rediscovered and opened in 1921

(Bray, 2008, p. xv, only tells us it contained records and journals). In any case the manuscript ended up with a Los Angeles collector, cardiologist Myron Prinzmetal, with the notation that it had come "From the papers of J. N. Nicollet, Astronomer." With the collector's death in 1987 it passed to the noted San Francisco dealer, Jeremy Norman. Comparison with other samples of Laplace's handwriting, together with the similarity of material to passages in the *Essai,* leave no doubt that it is by Laplace.

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