The Napoleon Series

Science under Napoleon

By Dr. Guillaume de Syon

Napoleonic France's contribution to science consisted in crystallizing changes begun in the French Revolution and building upon these. In so doing, the Emperor carried on the tradition of centralization that had already existed during the Ancien régime. The concentration of scientific talent in Paris was partly the result of revolutionary upheaval, when many scientists had joined the Levée en masse decreed in 1793 to defend France against pro-royalist armies. Consequently, the huge number of scientists present in a relatively small area encouraged exchanges of ideas and creativity.

As a young man, Bonaparte developed a general interest in science and a facility for mathematics which pushed him into artillery training during his time at the Ecole militaire. From then on, he made the acquaintance and studied, either formally or casually with mathematicians, physicists and natural scientists. Several became his friends, including Gaspard Monge (the father of descriptive geometry who helped found the Institut national in 1795later Institute of France) whose brother had trained Bonaparte in mathematics, Laplace, who was his school examiner, and Berthollet, whom the young general had met during the Italian campaign in 1796. All three supported Napoleon's admission to the Institute. Although the officer's publications suited him best for a post in the Second Class (moral and political sciences) or Third Class (Literature and Fine Art), he desperately wanted to be a member of the First Class (sciences). Despite tough competition, he was successfully elected, a move described as a victory both for him and for the Institute, hoping to incur political favor with the revolutionary regime.

Although Bonaparte attended several sessions of the Institute, his military duties took him away from France soon after his election. He did not forget his interest in science, however. Starting in 1798, when the notion of an Egyptian campaign was under discussion within the Directory, Bonaparte began recruiting the best French scientists of the day, and even succeeded in convincing middle-aged men such as Gaspard Monge and Nicolas-Jacques ContÇ to accompany him to Egypt. Although he named himself a member of one of the Scientific committees in Egypt, Bonaparte did not, however, make any presentations at scientific gathering, although he joked with some of his scientist friends that he ought to do something soon. His role, however, as a morale booster was just as important. Landing in Egypt at the same time as the French army, the scientists encountered heavy hardship in adjusting to weather, hygienic and building conditions. Months passed until a pleasant villa could be secured to house the Institute and its members, during which Napoleon regularly met with scientific leaders and promised them to make the necessary logistics available.

Monge, Berthollet and Magallon acted as temporary administrators, and oversaw the structuring of the Institute, with regular meetings scheduled to allow members to report

on their projects. The scientists were paid according to a specific pay scale set up in fall 1798, ranging from 500 livres for "savant de premiäre classe" to 50 livres for a "savant de 10 äme classe"). The institute put engineers and geographers to work on projects of immediate use, such as drawing a 1/30,000 scale map of Egypt, under the leadership of Cafarelli.. Meanwhile, Nicolas-Jacques ContÇ, among his many accomplishments on Egyptian soil, set up a factory to manufacture material for French army uniforms, and later presented a time-measuring machine at the 12 November 1799 meeting. Gaspard Monge for his part, investigated ancient world history by tracing the Roman canal that linked the Red Sea to the Nile river. Others focused more closely on Egyptian civilization, studying, for example, the recently discovered Rosetta stone. After Bonaparte's departure, the Institut d'Egypte continued to function until the arrival of the British.

Homesick, Monge was most pleased to return to France with Napoleon and assume the position of director of Ecole polytechnique (established in 1794 as a means to help French industry with a strong scientific foundation). He continued to support Bonaparte actively and advise him on political and scientific matters until the latter's fall.

When Napoleon took control of France, the organization of scientific knowledge was divided into three parts: scientific research, science teaching and training in engineering and medicine. Several scientific research centers thus thrived, like the Colläge de France and the MusÇum d'histoire naturelle (previously known as the jardin du Roi). Napoleon's contribution consisted in restructuring sceintific research and teaching.

Napoleon decided to extend the teaching of science beyond specialized schools and into the university. The Napoleonic system favored six major disciplines, botany, chemistry, geology, mathematics, physics and zoology. As first Consul, he the importance of furthering the sciences by offering several monetary prizes. The first was an award to the Italian scientist Volta on the occasion of the latter's visit to Paris to lecture on electricity at the Institute, which was followed by a yearly prize for work on electricity. Several other prizes followed, reflecting Napoleon's agenda of favoring cutting-edge work in the sciences and technology. While such practices were not unique to France, their number and compensatory amount were.

This does not mean that all scientists and inventors incurred success. American Robert Fulton tried to attract French interest in his Nautilus submarine (which he tested on the Seine river in 1800) and later in his steam boat (1803). While he did get a government grant, the lack of efficient propulsion prompted withdrawal of French support, and Fulton returned to United States.

Research was entrusted to newly centralized universities, the Ecole polytechnique and the Ecole normale supÇrieure. The Ecole polythechnique offered systematic training in engineering and theopportunity to learn in a research laboratory. Major French scientific figures like Monge and Laplace thus taught there while pursuing research. Although it combined the fields of science and engineering, it evolved slowly towards teaching more of the latter as a means to prepare men for military duty.

Napoleon's patronage of the sciences was often subordinated to his military goals. Under the Consulate, the Ecole polytechnique served as a surrogate military academy, and in 1804 it was completely reorganized along military lines (despite protests from Monge and others). By 1811, future officers were ordered away from it straight into military academies, while students not planning on a military career, yet who finished at the top of their class, would be drafted as military engineers.

The Ecole normale supérieure, derived from a short-lived 1795 experiment, was organized in 1808 to supply the teachers required for the new national centralized secondary education system. This system culminated in a series of examinations, the baccalaurÇat, a standardized exam designed to ensure that a uniform education had been imparted to all. That same year, the Université de France (or Imperial University) came into being, bringing French universities, until then independent, under control of the state.

Napoleon's establishment of the Imperial University system was an attempt to stifle conservative opposition by consolidating civic unity. This institution, set up by 1808 and 1810 decrees, was to oversee an educational structure that began with the lycÇe and included the municipal college (communaux) and the different faculties. Some fifteen faculties of scinces came to exist in Napoleonic times. Intended to diffuse knowledge, the model adopted raised contemporary criticism from Saint Simon for instilling a classics-based culture that stifled innovation by simply certifying students for particular jobs. In particular, the system called for specific degrees to hold specific appointments. The doctorate was essential to a university post, while teaching in a LycÇe could actually require an Aggregation, a rigorously competitive exam which, although sporadic in the eighteenth century, now became a standard requirement.

In the field of medicine, the French Revolution had dissolved the Royal Society of Medicine, and no regulatory system appeared in its place because of the notion of freedom of profession and associated "medical liberty," thus leading to an overabundance of doctors trained in diverse, and unsystematic manners. The urgent need for medical doctors to help the revolutionary armies reinstituted formal training in 1795, but it was not until 1803 through the Loi de Ventose that the state stepped in to license individuals to practice medicine, thereby displacing the old corporatist model that had dominated the profession until the French Revolution. The image and function of medicine thus began to change, but the primary function of medicine in warfare likely delayed interest in formally reorganizing the profession.

Napoleon's impact on science was also the result of a movement that began in the Enlightenment and flourished in the French revolution. Despite strict political control, a strong intellectual life continued to thrive under Napoleon and confirmed the utilitarian vision the emperor had for the sciences. The Institute, for example, continued to be recognized as a place where scientists might advise political leadership, and they were paid as public servants. The institute was also to spread the results of individual research. However, Napoleon did interfere in its functions by forcing a reorganization of its structure. As of 1803, rather than three classes, four were introduced. While sciences remained the

First Class, French Literature made the Second, History and Ancient Languages the Third, and Fine Arts the Fourth. Moral and political sciences was "disappeared" because, in Napoleon's view, they constituted a potential challenge to his power. His favoring of the sciences was also clear in the amount of the yearly prize awarded at the Inistitute: 3,000 Francs to the best project in the First Class, versus 500 for the Second.

Scientific life under Napoleon was predominantly centered around Paris. Other institutes included the Collège de France, and the Natural History museum. Other institutions existed, which allowed for a more flexible interaction among scientists, such as the société d'histoire naturelle de Paris or the Société d'encouragement pour l'industrie nationale. In addition, a smaller group, the société d'Arcueil, was first organized by Berthollet and Laplace and gained in importance as of 1807, when it began publishing a journal. A loosely organized association, its informal atmosphere provided a pleasant alternative to the stricter testing grounds of the First Class of the Institute, of which several founders of the Arcueil group were members.

Many French scientists distinguished themselves under Napoleon despite the latter's focus on the practical aspects of science. For example, Berthollet published an “Essai de statique chimique” (1803) which applied Newton's theory of chemical affinity. Gay-Lussac discovered the laws of expanding volumes of gases, while at the Muséum, Lamarck theorized about a transformationist theory that Darwin would study later to devise his own theory of evolution.

The main impact of Napoleon Bonaparte's involvement in the sciences was to centralize them. Such state control made for remarkable progress within state-sponsored scientific circles, but it also meant a restriction of funding outside of such spheres. The patronage of Napoleon also confirmed French domination in the sciences as had begun in the mid eighteenth century. However, other shortcomings soon were added to overcentralization, including the fact that there were too few outlets for the number of newly trained scientists the Napoleon-instituted system started churning out. Nonetheless, several of Napoleon's actions laid the foundation for further developments in French science and education and for France's industrial transformation later in the nineteenth century.

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