der von Humboldt and General von Mueffling, Chief of Staff of the Prussian armies, on the project to create a school on the model of Polytechnique in Berlin. Felix Klein writes on this subject:

"Those circles encouraged enterprises; it is they who created our technical schools, and launched the idea of creating a polytechnical institute of high scientific level on the model of the Ecole Polytechnique."[36]

Those same Franco-German networks contributed to the creation of a group of scientists around *Crelle's Journal,* which Carnot helped to create. That group brought together the greatest names in the sciences at that time: Dirichlet, Jacobi, Abel, Gauss, Riemann, Poncelet, Liouville, and others.

The corrupt influence of Cauchy

While Germany was developing these ideas fully, in France, Charles X and his protégé Augustin Cauchy[37] ran a wrecking operation against the scientific community. Jean Victor Poncelet (1788-1867), the inventor of projective geometry and republican pupil of Carnot and Monge, described the demoralization of the French scientists after 1816, under the patronage of Cauchy:[38]

"One would have to evoke the sad memory of the state of intimidation and degradation into which we had been plunged, in the period up to 1830, by reactionary, moral or political passions, which have exercised more influence than is presumed on the future of science."[39]

Cauchy, a mathematician close to the Jesuits, had taken the place of Carnot and Monge during the Bourbon Restoration. He deliberately attacked the "school of Monge" and, in so doing, created a deep feeling of demoralization in the schools. He used the classical oligarchical model to replace creative intuition in the sciences with pure Aristotelean formalism. Poncelet describes Cauchy's method in the following way:

"Such a way of proceeding, while it is reminiscent of the Ancients' without being better, gives much too much preponderance to particular facts over general facts; it breaks the link between theory and ideas, substituting a given series of theorems, recipes, so to speak, of the science of the discrete numbers. . . . Obviously, one could not impose such a method as a model without forgetting the true aim of Mathematics, and without taking the chance of bringing us back to the scholasticism of the Middle Ages, whose narrow spirit has been . . . much too propagated in the teaching in our high schools and colleges."[40]

And further:

"Isn't it most discouraging to see nowadays, that the most delicate geometrical discoveries under the heading of the philosophy of science, should be thus distorted, degraded by shallow minds, who have indeed contributed not a small part to throwing education into the disorder and indiscipline of which I spoke?"[41]

In 1826, Poncelet was forced to publish his works in Germany, in *Crelle's Journal.* He wrote:

"Finally, deeply humiliated and wronged . . . I have resolved, not without bitter patriotic regrets, to take recourse in the impartial Journal of Mathematics published . . . by the

36. Ibid.

37. Felix Klein, *Développement des Mathématiques au XIX*e siècle.

38. Baron Augustin Cauchy (1789-1857) was considered by many to be the founder of the French school of mathematical analysis. In fact, he was completely attached to formalizing prior results, and, a violent royalist reactionary, to extirpating the works of the republican mathematicians. He violently opposed the genial mathematician Evariste Gallois right up to the latter's strange death.

39. Jean Victor Poncelet (1788-1867), a student of Monge, French general and mathematician, revolutionized geometry by his researches, especially those undertaken during his imprisonment in Russia. He led the Ecole Polytechnique, where he patronized a large number of great mathematicians and physicists. See Pierre Beaudry, "The Metaphor of Perspective," *Fidelio,* Summer 1995, pp. 63-83.

40. J. Poncelet, *Polémique et Fragments divers,* p. 554.

41. Ibid.

British economics vs. the American System

Although after Lazare Carnot's death, French intellectual life came increasingly under the corrupt influence of Augustin Cauchy, still Carnot's legacy did not die out. It was continued, especially by Jean Victor Poncelet and his student Charles Laboulaye. The following excerpts from Laboulaye's Dictionary of Arts and Manufactures *give a vivid description of the approach to economics taken by the Ecole Polytechnique circles, who aligned themselves with the American System of political economy, against the English free-marketeers.*

"Man can act on surrounding nature not only as animals can, but with his intelligence. The discoveries which the latter makes every day, far from perishing with the individual, on the contrary accumulate in the diverse sciences which successive generations transmit to one another. Through such progress, man . . . can satisfy his needs and desires. Compare our demands with those of the savage who has only his physical force at his disposal. . . . Well, civilization could only develop among people capable of producing a quantity of products greater than what is consumed every day. It is the surplus which, brought together in the form of buildings, machinery, etc., forms the accumulated capital which is the strength and wealth of nations,

honorable and knowledgeable Dr. Crelle."[42]

How can we simultaneously pass judgment in politics, geometry, mechanics, and morality? How could we accuse the famous Cauchy, the founder of the French school of mathematical analysis?

Carnot and his followers would laugh at that question. Comparing the social and methodological aims of Carnot and Monge with those of Cauchy, one can understand that there is no separation between the quality of education, the pedagogical method, and the capacity of society to progress.

Compare the quotes from "In Praise of Vauban" by Carnot, with the following text, "On the Limits of Human Knowledge," written by the young Cauchy in Cherbourg in 1811, still under the influence of his Jesuit teachers:

"When one rapidly surveys the productions of the human mind, one is tempted to believe that human knowledge can grow and multiply to infinity. . . . However, if one observes that all our intelligence and our means are enclosed within limits from which they may never break free, one will become convinced that our knowledge is limited . . . that if man has not been able to visit the poles, he is left in eternal despair of ever coming close to those icy regions. . . . Who will ever dig a well 1,500 leagues deep? . . . Man has risen 1,500 fathoms into the atmosphere, but the rarefied air . . . will constantly bring back to the surface of the earth those who would want undertake a bolder enterprise. . . . An undecomposable body will ultimately be found. . . . The exact sciences are the sciences which can be regarded as brought to a close. Man can by force of sophistry be brought to doubt the truths taught him, but he cannot discover new ones . . . !"

Here is the man who is considered the glorious founder of the French mathematical school! Only a generation of mindless accountants could emerge out of Cauchy's ideas.

When Carnot died in Magdeburg in 1823, France was sinking into decadence, while Prussia was on its way to the summits. Had Carnot prevailed, it is probably not an exaggeration to say that we might have put the first man on the Moon in 1880. Just think of what the American model could have accomplished, in countries endowed with the density of scientists that France and Germany had!

42. Ibid.

and allows the individual, liberated from the imperious slavery of hunger, to develop his mind and enlarge the domain of human intelligence.

"The civilization which Aristotle considered possible only at the price of slavery, is made by progress dependent more and more on the accumulation of instruments of labor."

Laboulaye rejects the "statism" of Louis Blanc as well as the "anti-statism" of the Anglophile economists, and shows that the role of the state is precisely to encourage progress, by fostering technological development and education. He clearly differentiates the British from the American model:

"The creation of large companies must be avoided; the British-style industrial expansion which leads to pauperization and demoralization must be stopped. . . . In England, the country which, to this day, is still the most affected by the feudal era, where the descendants of the Normand have become large landowners . . . and have permitted the building of British industry in a most aristocratic fashion . . . industry is found to be organized on the model of ever-divisible territorial property, on the model of its fully aristocratic political society, totally feudal.

"In the United States of America . . . the organization of industry is totally democratic. The worker only works today, so to speak, in the hope of being his own master tomorrow, and the industrial enterprises grow in number more than in size. In the two countries, the industrial organization is the faithful image of the political laws; it is aristocratic in the first, democratic in the second. . . . The feeling that one's elevation in society is impossible has indeed largely contributed to the revolution of 1848, the laboring classes always hearing talk about the increase in bankers' wealth, in that of rich speculators, and amidst the crisis of industry, never seeing one of their own ranks rise into property through labor and innovation. Those are the unhappy seeds planted in times of demoralization, which have produced the false ideas that today pose the greatest dangers to the country. Oh, if we could get all the theoreticians to look at the beautiful American industrial scene! . . . Either the plain, dumb desire for improvement will lead us into communism . . . or it will surely lead us into a frightening equality of misery, through the degradation of everything and everyone; or we shall see an industrial democratic power with a broad base, gifted with an immense energy for productive work, well-being becoming the ensured reward of talent. . . . [This] will bring about growth in the wealth of the nation, to undreamed-of proportions."

Laboulaye lists several prescriptions for reaching that goal, including the following:

"*Credit.* The only country with the goal of putting credit at the disposal of any capability that will make it bear fruit, is America. Thus have we seen that country, in a few years, realize undreamed-of progress. . . . Of course, the goal was sometimes missed . . . and that nearly always happened when credit was turned into an instrument of speculation, instead of a means of fostering labor."