

its railways would not be less in discord than our own, ruled by Rouen time, and the principal object of the pretended unification would be lost. At the present time, it is true, this consideration is only retrospective, since it is evident to those who have eyes to see, that in the future any international horary amalgamation will be based on the united times of all meridians.

"What sacrifices would a similar amalgamation impose on France? In the first place, it would retard the clocks of our railways by four minutes, and civil time by nine minutes. But, from the experience furnished by the law of March 15, 1891, it can be affirmed that—were it not for the difference between interior and exterior timepieces of the stations—the reform would pass absolutely unperceived by the public.

"It can no longer be said that the change implies a question of national self-respect, since it is not to adopt English or German time, but to take up a universal system already adopted by the greater part of Europe, by all North America, and by a part of Asia (Japan).

"It is true that the new system will be imperfect so long as France will not adhere to it. It is not only by the adherence of France, however, that this system will be crowned. If France wants to justify the provisions of the 1891 Commissioner of the Senate, it will delay the execution for a hundred years. But we do not delude ourselves with views of this kind. During the time of waiting, our horary system will produce in the eyes of Europe—in the eyes of the world—the same effect as an old building out of line, encroaching on the public view, breaking the perspective of a beautiful straight avenue, and from which passers-by will only turn with displeasure. Is this a dignified situation for France?

"The situation is made worse from another cause. It has been said that Spain and Portugal are becoming friends again. If, according to the opinion of to-day, these two countries desire to unite their times, it is probable that, in order to avoid a conflict between the meridians of Madrid and Lisbon, they will take the time of Western Europe. If that occurs the isolation of France will be complete.

"There are two ways of escape from this difficulty. The first is based on the question of legality, and is that the Minister of Public Works shall invite our railway companies to retard their clocks by four minutes, and that the Minister of the Interior shall prescribe in his turn that all the public clocks be put back nine minutes with regard to the meridian of Paris. This international unification would have been made had not the law of March 15, 1891, been violated up to now.

"The other way, and the one altogether more frank and dignified, is this—that France should say to Spain, 'Would you be willing to unite our times? Let us adopt, with Portugal, the time of Western Europe, and agree as to the day when it shall be put in force simultaneously.' If France obtains this understanding, it will have done more for the unification of hours than any other nation; for each nation has only acted on its own account, while France, in bringing its adherence, would bring at the same time that of two companions. This would be at once the crowning of the system.

"I guarantee that France would receive the plaudits of the entire world, both of the old and the new, and in this question we should, at the first onset, have resumed the place which we generally occupy at the head of progress."

The editor of the *Revue Scientifique* remarks, in a footnote to M. de Nordling's article, "It is false patriotism that is willing to remain apart from other lands. Are the English who do not wish to adopt the metric system, and the Chinese who built a great wall at their frontier, good patriots? And are these two examples so worthy of admiration that our ambition should be to imitate them by refusing to accept the unification of hours. The conclusion can be formulated in three simple propositions:—

"(1) Adopt a single time for all France, without having the time in the interior of railway stations five minutes behind.

"(2) Adopt the time known as that of Western Europe—that is, Greenwich time, which is nine minutes behind Paris time, and which is in reality the time of central France (Havre, Le Mans, Tours, Poitiers, Angouleme, Auch, and Oran).

"(3) Urge Spain and Portugal to adopt this time."

It is satisfactory to find that the subject of international time is being seriously considered in France. The changes required to refer the times to the Greenwich meridian are so small that, but for national prejudice, they would doubtless have been made

long ago. However, we are not in a position to moralise upon the opinions of our neighbours as to the adoption of the time of Western Europe, for they point to our absurd system of weights and measures, and we are humiliated. There is little doubt that the French will adopt Greenwich time before the metric system is introduced into this country.

OLIGODYNAMIC PHENOMENA OF LIVING CELLS.

AMONG the botanical papers left by the late Prof. Carl v. Nägeli is a very remarkable one bearing the above title, which is now published in the *Denkschrift* of the *Schweizerische naturforschende Gesellschaft* by Prof. Schwendener and Prof. Cramer. The observations referred to occupied the closing years of Nägeli's life since 1880.

By oligodynamic phenomena Nägeli means those produced by excessively small quantities of metallic substances in solution. The experiments were made chiefly on two species of Spirogyra, *S. nitida* and *dubia*. If in water which is previously "neutral," *i.e.* not pathogenic to Spirogyra, a gold coin containing ten per cent. of copper is placed, the water acquires the oligodynamic property of killing the alga, and the poisoning may begin to manifest itself in as short a period as from three to six minutes. Nägeli satisfied himself that this effect is not due to the action of electricity or of any similar force, but is the result of infinitesimally small quantities of copper dissolved in the water, in the form of CuH_2O_2 combined with carbon dioxide. In this way one part of copper in 1000 million parts of water may act pathogenically on the alga. Similar results were obtained with silver, zinc, iron, lead, and quicksilver, while the absolutely insoluble metals gold and platinum were without effect. In this way distilled water is often poisonous to Spirogyra, and it is a remarkable fact that the poisonous metals communicate the property to glass vessels in which they are placed. The poisonous properties of the water may be diminished or entirely neutralised by placing in the water particles of some insoluble solid substances, such as sulphur, graphite, cellulose, wood, coal, silk, wool, &c., which present a large surface on which the metal is precipitated. For the same reason, while the alga will be killed if only a few filaments are present in the water, a much larger quantity will be entirely uninjured.

Oligodynamic poisoning manifests itself in the living cell in a different way from true chemical poisoning. In the former case the cell does not at once lose its turgidity; the protoplasmic uricle remains for a time adherent to the cell-wall, while the spiral band of chlorophyll detaches itself and becomes transformed into a solid mass surrounding the rounded nucleus of the cell. The substance of the band swells up, and presents, on transverse section, a cylindrical or oval form. The phenomena present some resemblances to those produced by electricity.

The very remarkable results here described are confirmed by Prof. Cramer, who has repeated the experiments, and finds, in all essential points, the phenomena to resemble those obtained by Nägeli.

A. W. B.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

A COURSE in Naval Architecture has been recently established at the Massachusetts Institute of Technology to provide a thorough training in the theory and methods of designing and building ships, together with a study of the properties requisite for safety and good behaviour at sea. It is intended to cover the same ground and accomplish the same results as the English and French government schools for training Naval Constructors. Like all the courses at the Institute it gives, in addition to professional and technical training and equipment, a good scientific and liberal education. Attention is directed mainly to the construction of merchant steamships; but some attention is given to problems arising in the design of men-of-war, which offer at once the most definite and the most intricate questions presented to the naval constructor. The theory of the construction of sailing vessels is also included in the course.

THE *Westminster Budget* of July 28 contains a record of the scholarships obtained by boys at our public schools during the