covery of a Northwest Passage" published in London in 1821. It is the report of the Polar Expedition of the *Hecla* and *Griper,* sent out by the British Admiralty and Board of Longitude in 1819–20 under command of Lieutenant William Edward Parry, R.N., F.R.S. Three surgeons, Drs. John Edwards, chief, Alexander Fisher and Charles James Beverly, assistant surgeons, accompanied the expedition and were placed in full charge of the food and sanitation as well as medical supplies of the two ships.

Recorded in the *Hecla's* log on Thursday, November 18, 1819, six months after the expedition had set sail from England:

> About this time our medical gentlemen began to remark the extreme difficulty with which sores of every kind healed.

Again on February 7, 1820, this entry by Lieutenant Parry is found:

> As we were now, however, approaching the coldest part of the season, it became more essential than ever to use the utmost caution in allowing the men to remain for any length of time in the open air, on account of the injury to their general health, which was likely to result from the inactivity requisite to the cure of some of the most trifling frost-bites. Mr. Edwards has favoured me with the following brief account of such cases of this nature as occurred on board the *Hecla:*—
>
> "The majority of the men who came into the sick-list in consequence of frost-injuries during the severity of the winter, suffered mostly in their feet and especially in their great toes;—few cures were effected without the loss of the nail and cuticle in which the vital power was invariably destroyed. The exfoliation of these dead parts was always slow, and often attended with small ulcerations at the extremity of the toe."

Two months before, the lemon juice ration had been reduced to ¾ of an ounce per man per day as a result of an accident to the expedition's major supply of bottled lemon juice. Ample antiscorbutic provision for the estimated two-year expedition had been made before setting sail.

My volume of Lieutenant Parry's *Journal,* which I fail to find listed in Hess's "Scurvy, Past and Present" or in any other bibliographies on historical records of scurvy, also contains a separate report by the ship's surgeons on the "State of Health and Disease of the Voyage."

Prefacing an autopsy report on the only fatality of the expedition, Surgeon Edwards states:

> A solitary case of diseased lungs occurred during this voyage, which, in its progress, was combined with scorbutic symptoms.

Since clear-cut autopsy reports on scorbutic subjects are relatively rare in the earlier literature, a more detailed account will be presented by the writer in a contemplated paper reviewing other aspects of this expedition.

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PURE SCIENCE

SUPPLEMENTING John M. Pearson's criticism[1] of Alexander W. Stern's note, "The Threat to Pure Science,"[2] since all sciences, apart from abstract mathematics, deal with material units of varying degrees of complexity in structure and behavior, does it not savor of priggishness to assume that "pure" sciences have a separate existence? The sciences constitute a vast interrelated mass of orderly arranged knowledge of natural phenomena, and it is high time that we should break down fictitious, pedagogical barriers separating them.

Beginning with recorded observations of the heavenly bodies, the science of astronomy recognized mathematically expressed "laws" (Kepler), an explanation of these laws with the aid of the newly developed calculus (Newton), and certain deviations from them (Einstein), based on the application of the recognized philosophical principle that all knowledge is relative, including even physical measurements. In 1868, Lockyer discovered helium in the sun with the aid of the spectroscope, but not until 1895 did Ramsay isolate it on earth from the mineral clevite; and modern astronomy leans heavily on physics and chemistry. From ancient times, astronomical knowledge served to guide travelers on land and sea; the invention of the chronometer by the mechanician, John Harrison, of the gyroscope compass by Elmer Sperry and the calculation of the "Ephemeris" are among the many gifts of other sciences to the science and art of navigation. Where does "pure" astronomy begin and end? Physics is learning from it of states of matter not yet producible by man.

Mr. Stern, a physicist, seems opposed to "professionalization." In physics, he says, this "will completely destroy freedom in science." In medicine, "the great majority of practitioners, being professional men, have neither time nor inclination to engage in research. Furthermore, as professional men they have no interest in pure science. Not until a scientific discovery or advance has gotten to the stage where they can use it, does it concern them. And then they are only concerned with its use and not with the scientific principles involved."

While in most sciences basic and spectacular advances are scored by a few, the success of these pioneers is facilitated by the painstaking work of

[1] SCIENCE, No. 2604.
[2] SCIENCE, No. 2599.

many mute inglorious Miltons, and even by the work of other famous men. Dr. William Beaumont laid a basis of our understanding of digestion by his observations on Alexis St. Martin, who had a stomach fistula due to a wound. The astounding Leonardo da Vinci aided anatomy and physiology by his precise observations and drawings. Scientific principles emerged from attempts to understand and explain observations. There is usually a delay in their emergence, and they may be modified by later knowledge.

"Pure" science is no quintessence which can be sublimated from the mass of observed facts without destroying or garbling the truth. Most scientific "laws" have exceptions, and the duty of scientists is to take broader rather than narrower views, so as to understand the very real coherence of natural phenomena, whether the knowledge is immediately useful or not, and irrespective of the calling (business, trade, profession) of the observer or explainer. Mr. Stern should be proud to be a professional man, for this term is applied to the more learned callings (theology, law, medicine, physics, chemistry, engineering), where some form of diploma or license from a competent examining body is generally demanded to protect the public, employers and other professional men from imposters and incompetents. Scientists know how to gauge and to classify their diverse fellows, and do so successfully.

As I understand the views of the British Society for Freedom in Science, it opposes the domination of scientific thought and activities by any group, especially through legislation framed by well-meaning but unscientific, warped or incompetent politicians who would regiment scientists. Despite the assertion of Lord Stamp, men of science are often "on top" as well as "on tap." Donald Nelson is a chemist; so is James B. Conant, and so was Charles Eliot, his predecessor as president of Harvard. Karl T. Compton and R. A. Millikan are physicists. Antoine Lavoisier, Benjamin Franklin and Benjamin Thompson (Count Rumford) are examples of what scientists have done in the field of politics. Men tend to gravitate to the positions where they are most useful. The great and increasing importance of science is opening many doors to those scientifically trained, especially if their training has been broad and human.

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I SHOULD like to discuss briefly some of Dr. Pearson's comments on my paper, as it concerns the nature of science. At a time when there is some cause for apprehension concerning the future of science it is essential to know what it is we are talking about. Dr. Pearson states that "one would conclude that Mr. Stern considers that 'pure science' is only metaphysics and excludes experimental and perhaps even theoretical science, if it is useful." I would no more consider pure science to be metaphysics than Dr. Pearson would consider applied science to be applied metaphysics. But I do state that science has nothing to do with usefulness. A scientific theory may be verified in the laboratory and not put to use thereafter, and it would still be part of the accepted body of science. And then there is the science of astrophysics, or would Dr. Pearson call it metaphysics?

Dr. Pearson has also stated that "the nature of science is the very essence of the practical." Does he believe that the researches of Faraday and Maxwell would lose any of their scientific value if no use were made of them? Does the scientific validity of the Bohr-Heisenberg Uncertainty Principle depend ultimately on whether some gadget can be made embodying this principle? Will the experimentally established phenomena of the fissure of uranium become part of science only when it is taken out of the laboratory and its principles incorporated in some rocket bomb? On the contrary, there is some justification for the belief that the growing socialization of science involves serious dangers to it. One must be alert and guard against scientific research degenerating into rubber, oil, textile, military—research. Such routine industrial research would ultimately destroy the adventure that is science. Fundamental investigations such as on the nature of the elementary particles, the relationship between field and matter, relativity and the universe, the study of extremely high energy particles in cosmic rays, the question of the production of multiple showers in one elementary act—would recede to the background. The pure science of physics whose study gives us a deeper insight and understanding of the ultimate constituents of the universe—matter and energy—may disappear. The desire to get at the nature of things would give place to the desire to make "better things." Thus, the age of scientific enlightenment and culture may be succeeded by an age of technology, where comfort replaces culture, and mankind replaces man. Science must be kept free, not because of the material comforts and riches it will bring us—that technology can do—but for the very preservation of our civilization.

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CEMENTING SINO-AMERICAN FRIENDSHIP

IN July, 1942, I published in SCIENCE under this same title the suggestion that scientists save unwanted reprints for eventual use in rehabilitating destroyed Chinese libraries after the war. The next month in the same periodical Wayne M. Hartwell, executive assistant to the Committee on Aid to Libraries in War Areas of the American Library Association, offered to