as those of Rumford, and disappeared from the textbooks. Or, if they are quoted, do let us have instructions as to how to melt two pieces of ice by rubbing them together in a vacuum.

NEWTON'S EARLY NOTEBOOK

In the Isaac Newton Memorial Volume, produced in 1927 to commemorate the two hundredth anniversary of Newton's death, there was published for the first time the contents of an early notebook, compiled by Newton as a boy or young man. The first part consists of a collection of rules and hints relating to drawing and painting (how to shade, how to enlarge a picture, to make a russet colour and so on); of receipts for cements, baits and other odd things; of cures for certain troubles; and of tricks. Prof. David Eugene Smith, who edited this matter, attributes it to some time within the period 1655–58 and apparently takes it to have been compiled by Newton. Prof. Louis Trenchard More, in his life of Isaac Newton, published last year, comments: "The most interesting, perhaps, of the items in this book, are those referring to drawing and the making of pigments, as they show the great interest he took in the art, and to the chemical and medicinal recipes which he jotted down".

This part of the notebook is, however, no collection of Newton's own, but is copied out from a book of receipts popular at the time, namely, John Bate's "The Mysteries of Nature and Art", of which the first edition was printed in 1634, and the third and last edition (a copy of which is in my possession) in 1654, shortly before the period to which we must attribute the part of the notebook in question. With this edition I have checked off all Newton's rules for drawing and painting, and many of his odd receipts—in fact, everything down to and including "To ingrave on a flint" in Prof. David Eugene Smith's reprint. The small remainder of this part of Newton's notebook consists of a few medical prescriptions and conjuror's tricks, which he may have picked up while lodging with Mr. Clark, the apothecary. I have not been able to trace them.

Another point of interest in Bate's book is that it contains full directions for making a water clock, which correspond to the account which Dr. Stukeley* gives of the water clock undoubtedly made by Newton. There is no doubt, then, that the "Mysteries of Nature and Art" was a book which young Newton freely consulted, and I conjecture that profounder historians than myself will find that it well repays study.

I may add that I find it a little difficult to accept Prof. Smith's attribution of date, 1655–58, for the first part of the notebook. On the first page of the book is the inscription:

ISAAC NEWTON HUNC LIBRUM
POSSIDET.
TESTE
EDVARDO SECKER.
PRET: 2^{d} OB.
1659.

Now, while a boy might write his name in a notebook, with his signature witnessed, as a schoolboy joke, some time after purchase, he is very unlikely to put the price, in this particular instance $2\frac{1}{2}d.$, except at the date of purchase. We know that Newton was very careful in his accounts of expenditure. I think we must take it that this inscription was inserted when the notebook was bought, and gives the date of the first entries.

* See Brewster's "Life of Sir Isaac Newton", vol. 1, p. 9. Louis Trenchard More, "Isaac Newton", p. 12.

Centenaries of Newcomb and Schiaparelli

SIMON NEWCOMB and Giovanni Virginio Schiaparelli were born within two days of one another, the former at Wallace, Nova Scotia, on March 12, 1835, and the latter at Savigliano, Piedmont, on March 14, and they died within a year of one another, Newcomb passing away on July 11, 1909, and Schiaparelli on July 4, 1910. Counting among their most distinguished contemporaries Lockyer, Huggins, Gill, Janssen, Loewy, Otto Struve, Auwers, Asaph Hall, Langley and Young, Schiaparelli was long regarded as the foremost of Italian astronomers, while Newcomb became to be recognised as the most eminent man of science in the United States.

They devoted themselves to widely differing branches of astronomy. Newcomb, as a member of the staff of the Naval Observatory, Washington, and as head of the "American Ephemeris and Nautical Almanac", during the course of forty years, contributed greatly to the advancement of gravitational astronomy, while Schiaparelli added immensely to the knowledge of meteors, comets and the planets. Honours were bestowed on them by many societies and institutions; both were associates and medallists of the Royal Astronomical Society, both were foreign members of the Royal Society and foreign associates of the Paris Academy of Sciences, while Newcomb's connexion with the United States Navy was recognised by Congress granting him the rank of a rear-admiral.

Of Newcomb, many appreciations were written after his death in 1909, but the most fascinating

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record of his life is his own "Reminiscences of an Astronomer", published when he was sixty-eight years of age. In this, when speaking of Cayley the mathematician, he said, "His life was that of a man moved to investigation by an uncontrollable impulse; the only sort of man whose work is destined to be imperishable". The remark might well apply to Newcomb himself, for when at the age of twenty-two years, after an unusual start in life—which had included two years' service under a quack doctor—he entered his own "world of sweetness and light" as a computer in the office of the "Nautical Almanac" at Cambridge, Mass., his genius found the avenue which was to lead him to the highest distinction.

Of his work, his travels and his friendships of the years 1857–77, Newcomb gave an account in the early chapters in his "Reminiscences": "On September 15, 1877," he went on to say, "I took charge of the Nautical Almanac Office. The change was one of the happiest in my life. I was now in a position of recognised responsibility, where my recommendations met with the respect due to that responsibility, where I could make plans with the assurance of being able to carry them out. . . ." He was editor of the "American Ephemeris and Nautical Almanac" for twenty years, and his most valuable work for science was done in connexion with it. It was this work which led to his being awarded the Copley Medal in 1890, and being elected a foreign associate of the Paris Academy of Sciences in 1895, in succession to Helmholtz.

A devoted public servant and an indefatigable worker, Newcomb set an inspiring example to all with whom he came in contact, while, said Sir Robert Ball, "His habitual loftiness of thought, nobility of character, dignified courtesy and ever-ready helpfulness endeared him to his many friends on both sides of the Atlantic".

Schiaparelli was far more fortunate than Newcomb in his early environment, and at the age of nineteen years graduated from the University of Turin in engineering and architecture. For a year or two he taught mathematics, but astronomy had already laid its hold upon him, and in the year that Newcomb began his work at Cambridge, Schiaparelli was able to enter the Berlin Observatory, then directed by Encke, and two years later secured a post at Pulkovo under the Struves. Recalled to Italy in 1860 to become assistant to Carlini at the Brera Observatory, Milan, in September 1862 on the death of Carlini he was made director of the Observatory and this post he held for thirty-eight years.

Schiaparelli's first year at Milan was marked by his discovery of the asteroid Hesperia. Four years after becoming the director, he announced his discovery of the connexion between meteors and comets, and in 1873 he published his "Le Stelle Cadenti", declared by Lockyer to be one of the greatest contributions to the astronomical literature of the nineteenth century. In 1877 he commenced his observations of Mars, in 1882 began the study of Mercury and Venus and between 1875 and 1899 made 11,000 measures of double stars. Failing sight brought an end to his observations, and in 1900 he retired. Among his later work was his book on the astronomy of the Old Testament, in the preparation of which he had examined the dates of 2,764 Babylonian documents which had been translated.

Schiaparelli's views on the so-called 'canals' on Mars led to much controversy, and it is worth recalling that it was this which reawakened Lowell's interest in astronomy and led him to erect the Lowell Observatory, at Flagstaff, Arizona, where just five years ago the planet Pluto was discovered.

Modern Plastics

SOME criticism has been made of the word 'plastics' as applied to the industry which goes under this name to-day. The word 'plastics' is usually associated with clay, putty or similar materials which can be worked and shaped by hand. But 'plastics' has not, even in the past, been limited to materials which retain their plasticity. Clay, having been moulded into shape while in a plastic condition, takes permanent form after baking, but the article in its permanent form is still classified in the 'plastics' group. The bulk of the products of the plastics industry in its modern form may similarly be characterised—initially plastic, they are converted by heat and pressure into permanent forms.

Bayer in 1872 first announced that phenols would react chemically with formaldehyde, but beyond this fact little further attention was paid by him to the product. Other workers investigated the reaction later, and Kleeberg in 1890 first discovered that it was not a pure product that was obtained, but a sticky viscous material. Then technical men more commercially minded came into the field and started investigations. One of the early patents was taken out by Luft in 1902, who described a horn-like material which could be turned and shaped into various articles. He described it as artificial horn. Others followed, but none of them appears to have made a material which was commercially useful, since they found

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